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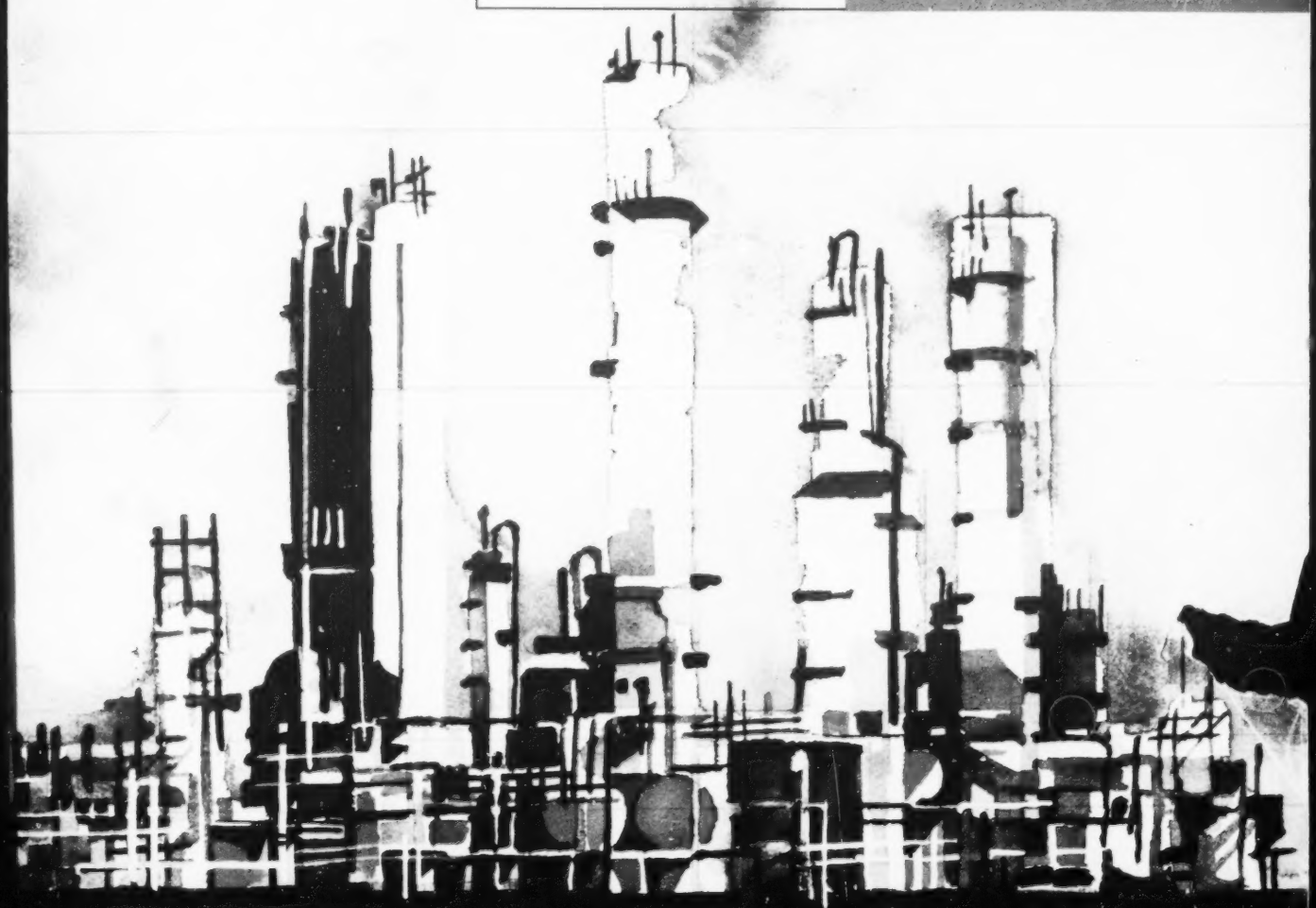
Chemical & Engineering NEWS
June 9, 1980



Facts & Figures

for the chemical industry Page 33

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News of the Week

- ***The recession has hit the chemical industry*** *and the short-term outlook for recovery isn't bright, Chemical Manufacturers Association spokesmen say.* ***Page 6***
- ***Union Carbide will sell*** *ferroalloys operations and related metals operations at 10 locations to a group of Norwegian and Canadian investors.* ***Page 6***
- ***New electrolytic process for copper refining*** *could reduce energy use 25%, eliminate sulfur dioxide emissions.* ***Page 7***
- ***The*** **Gossamer Penguin,** *a 50-lb aircraft outfitted with photovoltaic cells to power its electric motor, may be the forerunner of more rugged solar-powered planes.* ***Page 7***
- ***Analytical system*** *that automatically channels optimum quantity of sample components into a gas chromatograph/mass spectrometer developed by GE scientists.* ***Page 8***
- ***Science can play a big part*** *in solving the nation's energy, food, and health problems, says National Science Foundation five-year outlook study.* ***Page 8***

Business

- ***New Helium-Energy Act*** *would open up new markets for the now-wasted gas, set specific targets for storage; considered an improvement over previous bills.* ***Page 11***
- ***Air Products' new science center*** *initially will explore fundamental research in five targeted areas.* ***Page 12***

Government

- ***Third calendar*** *of upcoming government rules and regulations, published by the Regulatory Council, updates agencies' proposals for the year.* ***Page 14***

Science

- ***The eruption at Mount St. Helens*** *provides opportunity to determine health and environmental dangers of ash as well as its effect on soil chemistry.* ***Page 19***
- ***Wisconsin researchers*** *discover polysilastyrene, new family of silicon polymers with unique properties; investigate ways to use them.* ***Page 20***
- ***Dietary recommendation*** *from the National Research Council's Food & Nutrition Board draws sharp controversy over cholesterol stance.* ***Page 22***

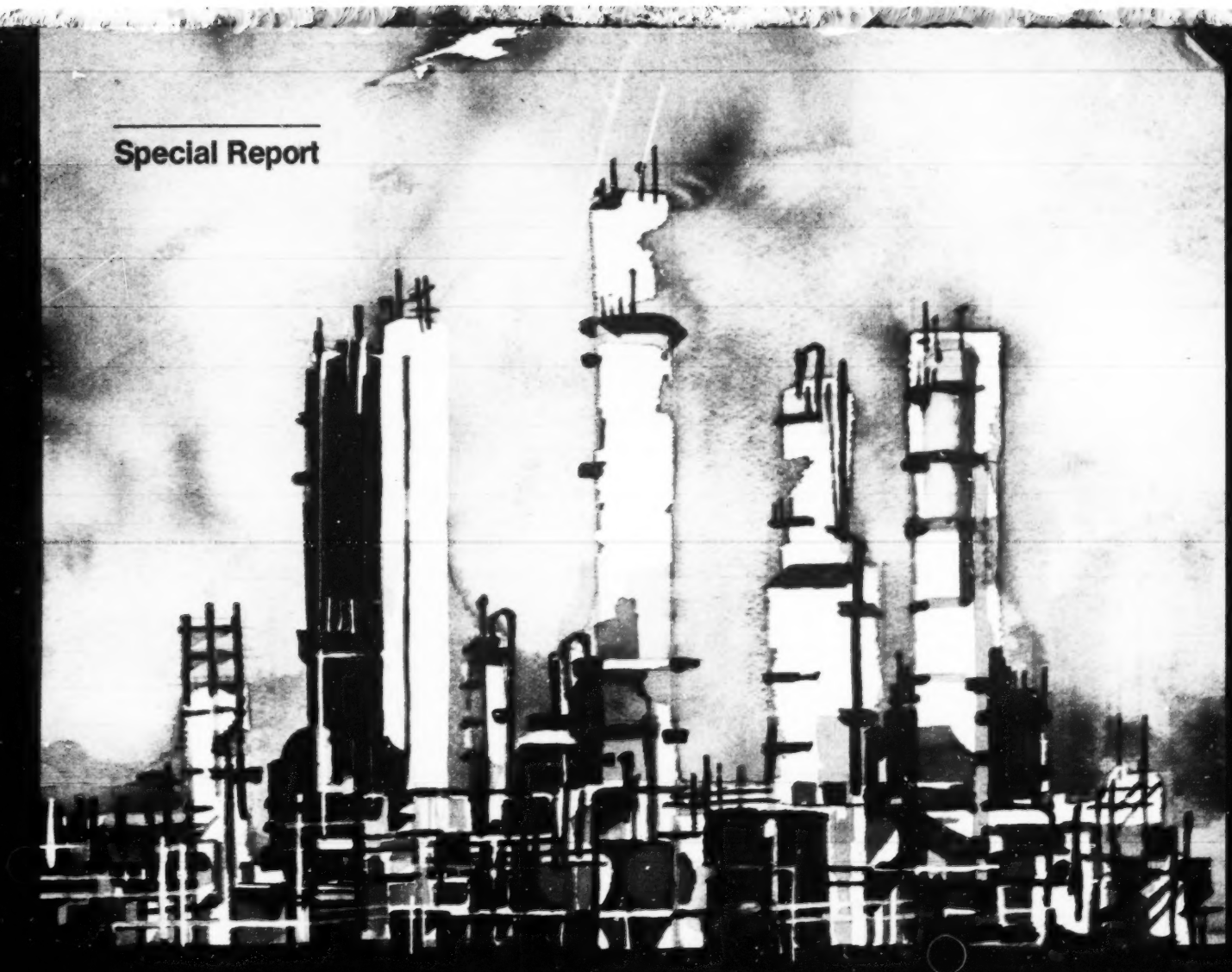
Facts & Figures

C&EN's yearly survey of the chemical industry *shows U.S. production up in 1979, especially for petrochemicals; higher profit margins; favorable trade balance; foreign firms fare well also.* ***Page 33***

ACS News

- ***ACS calls for revision*** *of the food safety laws in a public policy statement to Congressional subcommittees.* ***Page 92***

Special Report



Facts & Figures for the chemical industry

U.S. chemical producers in 1979 enjoyed the fourth straight year in which business trends generally were favorable. Output ran well ahead of the year before, although by year's end there were some signs that the pace was slackening. Selling prices climbed as producers strived to recover surging costs for raw materials and energy. Sales volume was spurred, as a result, and profits were never higher. The chief concern, as the year drew to a close, was that with recession spreading throughout the U.S. economy, the chemical industry's favorable results of the past two or three years would not be matched again in 1980. These results are spelled out in the tables and graphs on the following pages of Facts & Figures, C&EN's annual report on the chemical industry that it has published since 1956.

C&EN has gathered the information presented in Facts & Figures from many sources, including government agencies, trade associations, and the companies that manufacture chemicals and their many related products. To provide further insight, these data in many cases have been used to develop information on growth rates, measures of performance, and other indicators that help to evaluate how well the industry has met the challenges of the past decade.

Facts & Figures is divided into six sections. The first four detail various aspects of operations in the U.S. chemical industry. The fifth covers world trade in chemicals. The final section presents data on chemical industries in Canada, Japan, and Western Europe. Added to these for the first time this year are figures from Eastern Europe and China, two areas for which such information has been sparse in the past.

Section one: Production
Production of chemicals in the U.S. Growth trends for minerals, organic and inorganic industrial chemicals, plastics, man-made fibers, synthetic rubber, and fertilizers. 35

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Sales and earnings of U.S. chemical companies. Profitability. Stock prices. Financial analysis. Cash flow. Capital spending. R&D outlays. Individual company data. 43

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Section five: Foreign trade
World trade in chemicals. U.S. trade balance and share of world chemical markets. U.S. foreign trade in chemical products by product classes and geographical areas. 70

Section six: Foreign chemical industries
Production of chemical products in Western Europe, Japan, Canada, Eastern Europe, and China. Industry trends. Foreign trade. Company results. 72

Facts & Figures at a glance

Production of chemical products, overall, was 7% higher in the U.S. last year than it had been the year before. Plastics, as usual, recorded the greatest growth, up 13%. But output actually declined for paints.

Strength in plastics and fibers set the stage for big gains in output of several major petrochemical intermediates. Among inorganic compounds, chlorine and sodium hydroxide had banner years in production. So did phosphoric and nitric acids. All three major plant nutrients tallied better-than-average gains in production. Much of the growth can be credited to notable increases in exports of ammonia and phosphates. But U.S. consumption also rebounded from depressed 1978 levels.

High-density polyethylene and polypropylene set the pace among the plastics materials. Production also was up strongly for polyolefin and polyester fibers. A no-growth year for SBR took the luster off synthetic rubber output as a whole, however.

Producers of industrial chemicals increased their sales 22% last year, with higher selling prices a big factor. Profits expanded about 28%, moreover. As a result, both profit margins and return on stockholders' equity improved a bit.

Chemical companies' spending this year for new plant and equipment is expected to be well above 1979 outlays. But the increase largely will be offset by inflated construction costs. Spending for R&D also is due for a respectable boost.

Productivity continues to rise in the chemical industry, although the rate of improvement is slower than in many years of the past decade. The industry operated its plants closer to capacity last year than in those immediately preceding, but operating rates are slipping in 1980. The chemical industry used less energy in 1978 than it had in 1972, before the oil embargo, thanks largely to a drop in consumption of natural gas.

The number of people working in the chemical industry increased about 1.5% for the fourth year in a row, with the number of scientists and engineers up about twice that rate.

Exports of chemicals from the U.S. leaped a remarkable 37% last year, largely reflecting sharply higher foreign sales of both organic chemicals and plastics materials. Imports also were higher, but the U.S. trade surplus in chemicals was better than ever, approaching $10 billion. Trade in chemicals worldwide swelled 30% to $122.5 billion.

Business generally was favorable in foreign chemical industries. Production and sales were higher in Western Europe; so were earnings. In Japan, output climbed 9%, led by plastics; profitability also improved. Sales vaulted 19% in Canada, largely because of price increases; Canada's trade balance swung from deficit to a small surplus. Output continued to rise in Eastern Europe, but at a rate generally slower than in previous years. China reported some large increases in chemical production, particularly for fertilizer materials.

SECTION 1

PRODUCTION BY THE U.S. CHEMICAL INDUSTRY

Output of chemicals rose 7% last year

U.S. chemical plants increased their output steadily throughout last year. For 1979 as a whole, production of chemicals and allied products was about 7% higher than in the previous year. That's an annual rate of growth considerably higher than what was chalked up by all U.S. industry during the year and one that was slightly better than the average rate for the chemical industry alone during the past decade. As 1980 began, however, it was becoming clear that the pace of expansion was slowing and, indeed, that year-to-year comparisons soon will be turning unfavorable.

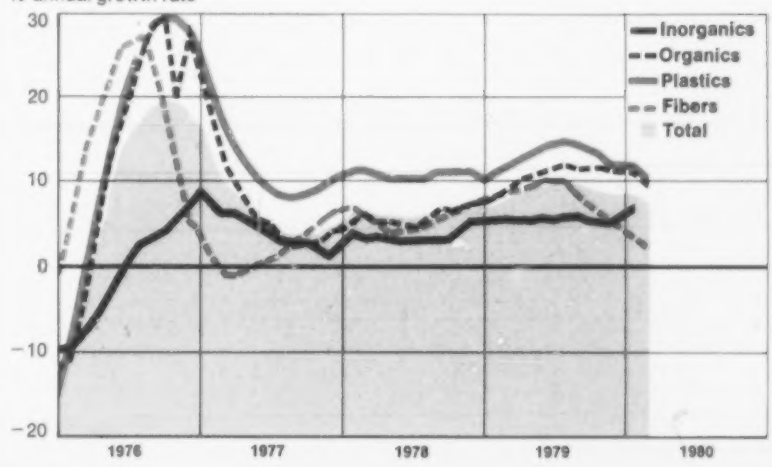
As usual, plastics and resins scored the best gains in production, with a rise of more than 10%. Among the top-volume plastics, the polyolefins did particularly well.

Man-made fibers had an above-average year as well, aided by heavy export demand and paced by polyester and polyolefin fibers. But a lackluster year—the second in a row—for big-volume styrene-butadiene rubber stymied growth for synthetic rubbers overall. Hurting from a switch toward longer-lasting and smaller tires, output of SBR has been trending downward since 1973.

Growth in plastics and fibers spilled over into petrochemical intermediates, such as ethylene and ethylene glycol, aromatic hydrocarbons, terephthalic acid, and acrylonitrile. In general, however, output of organic chemicals expanded a bit slower last year than in 1978.

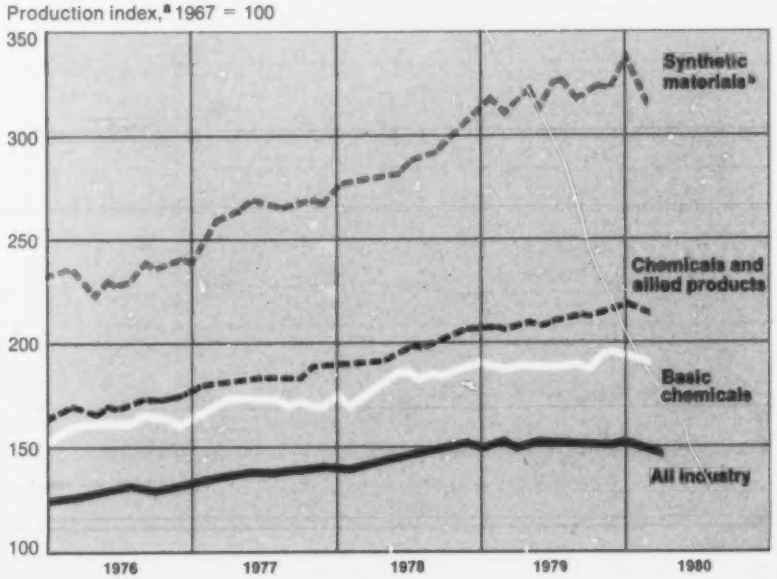
Among inorganic chemicals, production of chlorine and sodium hydroxide showed surprising strength, especially in comparison with the year before. Some of the materials tied to fertilizers—such as phosphoric and nitric acids, ammonium nitrate, and ammonia—also turned in good performances. And fertilizers themselves were buoyed both by export markets that were strong for the second straight year and by increased use of plant nutrients by U.S. farmers.

Growth rates for chemical production are slowing



[a] Average running annual growth rates in production of major plastics, inorganic and organic chemicals, and all chemicals, and in shipments of man-made fibers. **Sources:** International Trade Commission, Bureau of the Census, Society of the Plastics Industry, Textile Economics Bureau

Synthetics have spurred recent growth in chemical output



[a] Seasonally adjusted. [b] Includes plastics, synthetic rubber, and man-made fibers.
Source: Federal Reserve Board

TOP 50 CHEMICALS: Growth last year focused on organic chemicals

Rank 1979	Rank 1978[a]		Production: Billions of lb 1979	Production: Billions of lb 1978	Production: Common units[b] 1979	Production: Common units[b] 1978	Average annual change 1978–79	1977–78	1974–79	1969–79
1	1	Sulfuric acid	83.98	82.18	41,988 tt	41,088 tt	2.2%	7.1%	4.9%	3.5%
2	2	Lime[c]	38.78	38.78	19,392 tt	19,389 tt	0	2.4	−1.0	−0.1
3	4	Ammonia	36.24	34.38	18,121 tt	17,188 tt	5.4	−2.2	2.9	3.6
4	3	Oxygen	35.35	35.43	427 bcf	428 bcf	−0.2	8.9	1.8	4.5
5	5	Nitrogen	29.92	28.41	413 bcf	392 bcf	5.4	18.4	13.0	12.0
6	6	Ethylene	29.19	25.96	29,187 mp	25,955 mp	12.5	2.1	4.1	5.9
7	8	Sodium hydroxide	24.78	21.42	12,392 tt	10,710 tt	15.7	−2.0	2.1	2.3
8	7	Chlorine	24.22	22.10	12,108 tt	11,052 tt	9.6	4.5	2.4	2.6
9	9	Phosphoric acid	20.27	18.72	10,135 tt	9,358 tt	8.3	4.5	7.1	6.4
10	11	Nitric acid	17.13	15.87	8,564 tt	7,934 tt	7.9	−0.2	1.1	1.7
11	10	Sodium carbonate[d]	16.51	16.58	8,253 tt	8,290 tt	−0.4	0	1.8	1.6
12	12	Ammonium nitrate[e]	15.60	14.41	7,800 tt	7,207 tt	8.2	0.4	0.7	2.9
13	13	Propylene	14.30	13.01	14,298 mp	13,013 mp	9.9	1.0	6.4	7.1
14	15	Urea[f]	13.53	10.89	13,534 mp	10,888 mp	24.2	22.5	12.3	8.6
15	16	Benzene	12.72	10.94	1,730 mg	1,488 mg	16.3	−3.1	3.0	3.9
16	18	Toluene[g]	11.86	7.64	1,636 mg	1,054 mg	55.2	−1.2	12.1	8.0
17	14	Ethylene dichloride	11.82	11.00	11,821 mp	11,001 mp	7.5	0	5.2	7.0
18	17	Ethylbenzene	8.53	8.39	8,530 mp	8,385 mp	1.7	0.9	7.1	5.7
19	20	Vinyl chloride	7.54	6.94	7,544 mp	6,941 mp	8.6	16.0	6.1	7.2
20	19	Styrene	7.48	7.19	7,484 mp	7,186 mp	4.0	4.6	4.7	4.9
21	22	Methanol	7.41	6.44	7,411 mp	6,443 mp	15.1	−0.2	1.5	5.8
22	25	Terephthalic acid[h]	7.26	5.95	7,263 mp	5,954 mp	22.0	10.1	11.3	13.9
23	21	Carbon dioxide[i]	7.07	6.69	3,533 tt	3,180 tt	5.7	12.9	13.0	11.7
24	24	Xylene[g]	6.89	6.13	950 mg	845 mg	12.4	0.7	3.4	9.5
25	23	Formaldehyde[j]	6.45	6.38	6,446 mp	6,380 mp	1.1	5.5	2.3	3.9
26	26	Hydrochloric acid	5.95	5.58	2,973 tt	2,790 tt	6.6	2.5	3.8	4.5
27	27	Ethylene oxide	5.28	5.01	5,277 mp	5,012 mp	5.4	14.8	4.7	4.5
28	28	Ethylene glycol	4.60	3.90	4,597 mp	3,903 mp	17.9	6.2	6.6	6.0
29	30	*p*-Xylene	4.18	3.52	4,175 mp	3,516 mp	18.8	10.8	9.1	9.9
30	32	Cumene	4.00	3.38	3,995 mp	3,380 mp	18.3	27.8	6.6	9.0
31	29	Ammonium sulfate	3.94	3.87	1,971 tt	1,943 tt	1.8	−11.0	−1.4	0.3
32	31	Butadiene (1,3-)[k]	3.55	3.52	3,551 mp	3,515 mp	0.9	10.8	−0.7	1.3
33	34	Acetic acid	3.33	2.78	3,329 mp	2,775 mp	19.8	8.0	5.2	6.5
34	33	Carbon black	3.33	3.35	3,329 mp	3,346 mp	−0.6	−0.5	−0.1	2.3
35	35	Phenol[l]	2.95	2.68	2,945 mp	2,682 mp	10.1	14.7	5.1	6.1
36	38	Acetone	2.50	2.52	2,502 mp	2,519 mp	−0.8	13.5	4.8	5.1
37	36	Aluminum sulfate	2.46	2.62	1,232 tt	1,309 tt	−5.9	4.3	−0.3	−0.2
38	39	Cyclohexane	2.41	2.33	2,412 mp	2,331 mp	3.4	4.0	0.5	0.8
39	37	Sodium sulfate[m]	2.34	2.34	1,173 tt	1,168 tt	0.4	−2.5	−2.7	−2.3
40	41	Propylene oxide	2.25	2.05	2,249 mp	2,047 mp	9.8	9.7	5.1	6.7
41	40	Calcium chloride[n]	2.03	2.06	1,015 tt	1,031 tt	−1.5	6.6	−4.0	−1.4
42	42	Acrylonitrile	2.02	1.75	2,018 mp	1,752 mp	15.4	6.4	7.4	5.7
43	44	Vinyl acetate	1.98	1.69	1,983 mp	1,692 mp	18.6	6.7	7.2	10.5
44	43	Isopropyl alcohol	1.97	1.73	1,968 mp	1,730 mp	13.9	−8.4	0.3	−0.5
45	45	Adipic acid	1.80	1.62	1,800 mp	1,621 mp	11.1	5.6	4.0	4.0
46	46	Sodium silicate	1.55	1.60	777 tt	802 tt	−3.1	5.5	0.1	1.7
47	48	Sodium tripolyphosphate	1.51	1.48	756 tt	739 tt	2.3	3.1	−3.5	−4.6
48	47	Acetic anhydride	1.51	1.50	1,505 mp	1,500 mp	0.7	0	−1.6	−1.0
49	49	Titanium dioxide	1.48	1.40	741 tt	701 tt	5.7	2.0	−1.2	2.2
50	50	Ethanol[l]	1.31	1.27	1,308 mp	1,267 mp	3.1	−5.4	4.2	−5.7
		TOTAL INORGANICS IN TOP 50	**374.44**	**359.28**			**4.3%**	**4.5%**	**3.1%**	**3.2%**
		TOTAL ORGANICS IN TOP 50	**190.62**	**166.10**			**14.8%**	**3.4%**	**5.5%**	**6.1%**
		GRAND TOTAL OF TOP 50	**565.06**	**525.38**			**7.6%**	**4.2%**	**3.8%**	**4.1%**

a Revised. b tt = thousands of tons, bcf = billions of cubic feet, mp = millions of pounds, mg = millions of gallons. c Except refractory grade. d Synthetic and natural. e Original solution. f Primary solution. g All grades. h Includes both acid and ester, without double counting. i All forms. j 37% by weight. k Rubber grade. l Synthetic only. m High and low purity. n Solid and liquid. **Sources:** Bureau of the Census, Bureau of Mines, International Trade Commission, C&EN estimates

PRODUCTION: Gains in 1979 were above the long-term trend by a small margin

Industrial production indexes, 1967 = 100	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Annual change 1978–79	Annual change 1969–79
Total index	152.2	146.1	138.2	130.5	117.8	129.3	129.8	119.7	109.6	107.8	111.1	4%	3%
Manufacturing, total	153.2	146.8	138.4	130.3	116.3	129.4	129.8	118.9	108.2	106.4	111.0	4	3
Nondurable manufacturing	163.3	156.9	150.5	141.8	126.4	134.6	133.8	126.5	116.6	112.3	111.5	4	4
Chemicals and products	210.4	197.4	185.7	170.9	147.2	159.4	154.5	143.6	125.9	120.4	118.4	7	6
Chemicals and synthetic materials	232.8	216.7	201.1	185.1	154.1	176.7	171.9	156.4	135.8	126.9	125.0	7	6
Basic chemicals	190.9	181.9	171.8	161.8	135.9	153.3	147.7	137.7	123.7	117.9	117.0	5	5
Alkalies and chlorine	131.4	119.7	119.2	119.0	106.5	125.6	123.8	120.2	114.4	119.1	115.1	10	1
Gases, coal tar, inorganic pigments	193.7	186.0	174.3	164.4	133.3	165.0	157.8	146.5	125.6	123.0	127.8	4	4
Basic organic chemicals	233.3	221.2	204.7	189.8	155.3	177.9	170.0	155.3	139.7	128.7	125.3	5	6
Inorganic chemicals, nec	133.8	129.3	128.5	124.3	112.9	112.6	110.8	107.8	99.2	97.7	97.6	3	3
Acids and fertilizer materials	140.5	133.6	124.2	117.6	108.4	116.6	113.1	111.5	105.3	106.2	104.9	5	3
Synthetic materials	318.2	287.6	260.8	232.5	191.0	224.4	221.1	194.7	160.4	145.1	141.2	11	8
Plastics materials	415.7	366.5	320.3	280.1	213.1	258.5	243.3	217.4	166.2	155.7	148.6	13	11
Synthetic rubber	130.5	127.5	124.5	118.7	101.2	129.7	135.6	126.9	117.2	114.8	117.7	2	1
Man-made fibers	270.7	250.9	236.6	214.3	191.2	214.4	220.1	189.1	164.9	142.2	139.8	8	7
Chemical products	189.0	179.0	170.9	157.2	140.7	142.8	137.7	131.3	116.4	114.2	112.0	6	5
Drugs and medicines	238.2	220.6	213.9	191.5	174.1	179.6	170.1	155.5	135.1	127.5	119.0	8	7
Soap and toiletries	171.6	163.8	155.0	143.0	127.7	128.1	129.0	130.3	114.1	116.9	111.1	5	4
Paints	126.2	132.6	125.6	122.8	114.2	119.2	114.7	118.0	111.1	105.6	112.0	−5	1
Agricultural chemicals	221.6	211.8	201.1	185.4	163.9	144.6	127.0	108.9	103.5	107.9	106.1	5	8
Petroleum products	143.6	145.2	142.6	133.5	124.1	124.7	128.5	122.1	116.7	113.2	108.4	−1	3
Rubber and plastics products	270.0	253.6	232.3	199.7	166.7	195.2	184.1	172.4	147.6	132.3	130.2	6	8

nec = not elsewhere classified. **Source:** Board of Governors of the Federal Reserve System

MINERALS: Sulfur makes best showing among large-volume materials

Thousands of tons	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Annual change 1978–79	Annual change 1969–79
Bromine, production	250[a]	223	217	230	204	216	209	193	178	175	168	12%	4%
Iodine, consumption[b]	4.3[a]	4.0	4.3	3.6	3.1	3.8	3.5	3.4	3.3	3.2	3.0	8	4
Imports[c]	3.1	3.4	3.5	3.2	2.7	4.0	3.1	3.1	3.6	3.0	2.9	−9	1
Lime, production[d]	20,435[e]	20,484	19,987	20,257	19,159	21,645	21,132	20,332	19,635	19,788	20,250	0	0
Phosphate rock, marketable production	56,891	55,156	52,091	49,231	48,806	45,676	42,128	40,823	38,878	38,731	37,718	3	4
Exports	15,827	14,187	14,584	10,398	12,270	13,895	13,873	14,272	12,584	11,735	11,334	12	3
Potash (K_2O equivalent),[f] production	2,453	2,484	2,457	2,400	2,501	2,552	2,603	2,659	2,587	2,729	2,804	−1	−1
Imports[g]	5,691	5,186	5,076	4,594	3,797	4,326	3,587	2,961	2,766	2,605	2,332	10	9
Apparent consumption[h]	7,624	6,838	6,605	6,150	5,113	6,086	5,563	4,816	4,815	4,728	4,720	11	5
Salt, total sold or used[i]	43,100[e]	42,896	43,439	44,218	41,057	46,565	43,939	45,051	44,106	45,928	44,277	0	0
Evaporated	6,000[j]	5,872	5,704	5,634	5,372	5,951	5,913	5,879	5,956	5,530	5,695	2	1
Rock	14,200[j]	14,688	14,958	15,668	14,283	14,835	12,347	14,434	13,700	14,170	13,397	−3	1
Salt in brine[k]	22,800[j]	22,336	22,777	22,917	21,401	25,779	25,680	24,737	24,449	26,228	25,185	2	−1
Sodium carbonate, production[l]	8,253	8,290	8,040	7,560	7,130	7,566	7,535	7,523	7,163	7,071	7,035	0	2
Sulfur, production[m]	13,339	12,318	11,824	11,992	12,610	12,789	12,231	11,444	10,730	10,703	10,690	8	2
Apparent consumption[n]	15,145	13,889	12,850	12,060	11,875	12,115	11,463	11,036	10,274	10,334	10,269	9	4
Frasch, production	7,007	6,226	6,520	7,016	8,077	8,849	8,518	8,165	7,868	7,932	8,004	13	−1
Apparent consumption[n]	7,466	6,506	6,309	6,041	6,439	7,001	6,680	6,753	6,328	6,283	6,422	15	2
Recovered elemental, production[o]	4,486[p]	4,478[p]	3,995	3,514	3,326	2,948	2,706	2,184	1,787	1,631	1,593	0	11
Apparent consumption[n]	5,833	5,769	5,232	4,558	4,228	4,123	3,775	3,132	2,725	2,766	2,619	1	8
Other, production[q]	1,845	1,615	1,310	1,462	1,208	992	1,008	1,096	975	1,140	1,093	14	5
Apparent consumption[n]	1,845	1,615	1,310	1,462	1,208	992	1,008	1,152	1,220	1,285	1,228	14	4

a Estimated. b Estimated apparent consumption of crude elemental iodine. c Crude elemental iodine. d Includes Puerto Rican production. e Preliminary. f Includes muriate and sulfate of potash, potassium magnesium sulfate, and parent salts; excludes other chemical compounds containing potassium. g Includes nitrate of potash. h Calculated from sales plus imports minus exports. i Total obtained by all recovery methods that was sold or used by domestic producers (figures differ slightly from U.S. production figures); figures include Puerto Rican production. j C&EN estimate. k Sold or used as such. l Natural and synthetic. m Sulfur content basis. n Calculated from shipments plus imports minus exports (sulfur content basis). o From natural gas plants and petroleum refineries, plus a small quantity from a coking operation. p Includes a small quantity from utility plants. q From by-product sulfuric acid (basis 100%) produced at copper, zinc, and lead plants, and from pyrites, hydrogen sulfide, and liquid sulfur dioxide. **Source:** Bureau of Mines

ORGANIC CHEMICALS: Majority of leading products were made in greater quantities in 1979

Millions of lb unless otherwise noted	Production											Annual change	
	1979[a]	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1978–79	1969–79
Acetic acid, synthetic	3,329	2,776	2,570	2,463	2,197	2,584	2,429	2,235	1,956	1,932	1,770	20%	7%
Acetone	2,502	2,519	2,219	1,869	1,640	1,980	1,989	1,818	1,538	1,615	1,518	−1	5
Acrylonitrile	2,019	1,752	1,646	1,518	1,215	1,412	1,354	1,115	979	1,039	1,157	15	6
Aniline	681	606	584	544	407	551	458	410	366	398	334	12	7
Benzene, mg[b,c]	1,730	1,488	1,457	1,425	1,024	1,488	1,453	1,252	1,076	1,134	1,185	16	4
Bisphenol A	576	471	455	449	293	370	320	255	187	202	182	22	12
1,3-Butadiene[d]	3,552	3,515	3,259	3,507	2,597	3,682	3,644	3,527	3,340	3,101	3,123	1	1
***n*-Butanol**	732	756	660	625	490	558	519	590	466	468	405	−3	6
Caprolactam	945	919	867	780	713	668	656	640	575	na	na	3	na
Carbon disulfide	447	476	505	508	479	782	777	768	753	721	799	−6	−6
Carbon tetrachloride	704	737	809	857	906	1,163	1,047	997	1,009	1,011	883	−4	−2
Cumene	3,995	3,380	2,644	2,716	2,003	2,906	2,665	2,293	2,144	1,983	1,687	18	9
Cyclohexane	2,412	2,332	2,265	2,187	1,734	2,352	2,123	2,298	1,748	1,841	2,232	3	1
Diisodecyl phthalate	177	171	161	143	106	147	171	153	136	123	137	4	3
Dodecylbenzene[e]	627	526	526	529	495	533	498	524	550	553	529	19	2
Ethanol, synthetic	1,308	1,267	1,339	1,496	1,429	1,618	1,962	1,851	1,630	1,957	2,361	3	−6
Ethanolamines[f]	421	362	308	286	258	307	293	284	259	264	255	16	5
Ethyl chloride	572	540	612	669	575	662	660	576	620	678	679	6	−2
Ethylbenzene[g]	8,530	8,385	8,312	5,770	4,822	6,048	5,688	5,676	4,984	4,827	4,907	2	6
Ethylene	29,187	25,955	25,172	22,475	20,499	23,891	22,329	20,852	18,450	18,089	16,436	12	6
Ethylene dichloride	11,821	11,001	10,997	8,042	7,977	9,165[h]	9,293[h]	7,809	7,558	7,460	6,037	7	7
Ethylene glycol	4,597	3,904	3,675	3,335	3,809	3,341	3,278	3,761	3,070	3,038	2,571	18	6
Ethylene oxide	5,277	5,012	4,364	4,184	4,467	4,200[i]	4,167	3,962	3,598	3,865	3,408	5	4
2-Ethylhexanol	318[j]	420	493	450	387	395	402	526	287	457	405	−24	−2
Formaldehyde, 37%	6,446	6,381	6,046	5,449	4,558	5,764	6,424	5,652	4,522	4,427	4,398	1	4
Isopropyl alcohol	1,968	1,730	1,888	1,936	1,521	1,939	1,835	1,790	1,674	1,919	2,014	14	0
Maleic anhydride	354	341	294	264	216	290	282	274	229	215	201	4	6
Methanol, synthetic	7,411	6,443	6,453	6,242	5,176	6,878	7,064	6,472	4,950	4,932	4,206	15	6
Methyl chloride	449	454	476	378	366	493[h]	544[h]	454	437	423	403	−1	1
Methyl ethyl ketone	649	661	512	428	425	506	541	509	484	480	484	−2	3
Methyl chloroform	710	644	635	631	459	592	548	441	375	366	324	10	8
Methylene chloride	635	570	478	538	497	609	520	471	401	402	366	11	6
Perchloroethylene	770	725	614	669	679	734	706	734	705	707	635	6	2
Phenol, synthetic[k]	2,946	2,682	2,338	2,121	1,746	2,298	2,241	2,052	1,744	1,708	1,636	10	6
Phthalic anhydride	1,039	978	926	902	702	977	1,023	933	794	734	760	6	3
Propylene[c]	14,298[l]	13,014[l]	13,328[l]	10,030[l]	8,709[l]	10,475	9,884[m]	8,472[m]	6,891[m]	6,641[m]	7,235[m]	10	7
Propylene glycol	617	547	489	517	391	510	502	563	421	428	461	13	3
Propylene oxide	2,249	2,047	1,866	1,823	1,524	1,756	1,753	1,520	1,194	1,179	1,177	10	7
Styrene, monomer	7,484	7,186	6,867	6,301	4,673	5,956	5,975	5,941	4,682	4,335	4,648	4	5
Terephthalic acid, dimethyl ester[n]	4,264	5,954	5,410	5,051	4,614	4,262	2,564[o]	4,405[p]	3,574	2,989	2,750	22	10
Toluene, mg[b,c]	1,637	1,054	1,018	999	705	922	958	916	876	830	759	55	8
Vinyl acetate	1,983	1,692	1,586	1,481	1,290	1,403	1,503	1,211	931	803	729	17	11
Vinyl chloride	7,544	6,941	5,986	5,677	4,196	5,621	5,351	5,089	4,336	4,040	3,736	9	7
***o*-Xylene**	1,075	1,013	985	854	703	1,056	1,068	832	785	799	850	6	2
***p*-Xylene**	4,175	3,516	3,172	2,911	2,484	2,707	2,326	2,208	1,662	1,590	1,628	19	10

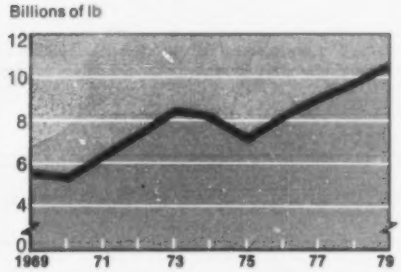
a Preliminary figures. b Tar distillers not included to avoid disclosing individual company data; includes material for use in blending motor fuels. c All grades. d Rubber grade. e Includes straight-chain dodecylbenzene, tridecylbenzene, and other straight-chain alkylbenzenes. f Mono-, di-, and triethanolamines. g Does not include ethylbenzene produced and consumed in continuous-process styrene manufacture. h Production figure may be too low, because some methyl chloride and ethylene dichloride were produced but not separated or accurately measured by some producers. i Approximate figure. j By weight. k Does not include data for coke ovens and gas retort ovens. l Includes refinery propylene. m Includes data for propane-propylene mixture. n Includes both the acid and its dimethyl ester (DMT), without double counting; acid figures multiplied by 1.16 to convert to equivalent DMT. o Includes only dimethyl ester and not acid. p Figure may be too high because of possible double counting of some acid and ester. na = not available. **Source:** International Trade Commission

INORGANICS: Growth strongest last year for chlorine, caustic soda, and phosphoric acid

Thousands of tons unless otherwise noted	Production											Annual change	
	1979[a]	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1978–79	1969–79
Aluminum sulfate[b]	1,223	1,309	1,255	1,202	1,146	1,257	1,233	1,193	1,127	1,191	1,253	−7%	0%
Ammonia,[c,d] 100%	18,067	17,188	17,765	16,716	16,419	15,733	15,208	15,169	14,538	13,824	12,769	5	4
Ammonium nitrate,[e] 100%	7,798	7,210	7,177	7,186	7,088	7,542	7,235	6,863	6,635	6,456	5,891	8	3
Ammonium sulfate,[d,f] 100%	na	2,449	2,264	2,010	2,106	2,120	1,987	1,858	1,821	1,894	1,916	na	na
Carbon dioxide[g]	3,153	3,001	2,610	2,064	1,850	1,804	1,566	1,610	1,344	1,135	1,167	5	10
Chlorine gas[h]	12,102	11,052	10,573	10,378	9,167	10,753	10,402	9,854	9,352	9,764	9,376	10	3
Hydrochloric acid,[i] 100%	2,971	2,791	2,668	2,542	2,009	2,470	2,534	2,360	2,099	2,014	1,911	6	5
Hydrogen,[j,k] bcf, 100%	96	91	85	82	74	82	65	59	56	60	65	5	4
Nitric acid,[l] 100%	8,555	7,934	7,987	7,791	7,527	8,120	8,398	7,981	7,638	7,603	7,223	8	2
Nitrogen gas,[j,m] bcf, 100%	414	383	328	289	252	243	227	194	168	151[n]	133[n]	8	12[o]
Oxygen,[j,m] bcf, 100%	429	430	392	388	353	390	389	352	319	284[n]	276[n]	0	4[o]
Phosphoric acid, 100% P_2O_5	10,185	9,359	8,745	7,949	7,677	7,213	6,927	6,712	5,970	5,683	5,435	9	6
Phosphorus[p]	461	441	430	437	450	524	526	541	545	597	623	5	−3
Sodium hydroxide, 100%	12,388	11,326	11,000	10,516	9,635	11,189	10,734	10,216	9,667	10,141	9,917	9	2
Sodium phosphate[q]	756	739	717	724	770	903	967	1,033	1,040	1,208	1,215	2	−5
Sodium silicate[r]	779	796	760	747	724	770	723	661	636	628	657	−2	2
Sodium sulfate,[s] 100%	1,175	1,168	1,199	1,232	1,227	1,348	1,437	1,327	1,356	1,373	1,475	1	−2
Sulfuric acid,[t] 100%	41,973	41,088	38,337	34,878	32,360	33,936	31,949	31,183	29,035	29,525	29,537	2	4
Titanium dioxide,[u] 100%	725	701	687	713	603	787	785	693	678	655	644	3	1
Urea, 100%	6,749[v]	6,506[v]	5,072	4,498	3,799	3,789	3,543	3,467	3,125	3,119	2,972	4	9

a Preliminary. b Commercial, 17% Al_2O_3; includes municipalities except in 1979. c Synthetic anhydrous. d Excludes by-product ammonia liquor and ammonium sulfate. e Original solution. f Synthetic and noncoke by-product. g Solid, liquid, and gas; excludes quantities produced and consumed in plants making soda ash or urea, and quantities produced and transferred to other plants for further processing. h Includes quantities liquefied for use, storage, or shipment. i Includes anhydrous hydrochloric acid production. j High- and low-purity gas. k Liquid and gas; excludes amounts vented and used as fuel, and amounts produced in petroleum refineries for captive use. l Includes unspecified amounts of nitric acid produced but not withdrawn from the system. m Excludes amounts produced and consumed in making synthetic ammonia or ammonia derivatives. n High-purity gas only. o Annual change for 1971–79. p Elemental, white (yellow), and red. q Tripolyphosphate (100% $Na_5P_3O_{10}$). r Soluble silicate glass (water glass), solid and liquid (anhydrous); excludes amounts produced and consumed in making meta-, ortho-, and sesquisilicates. s Anhydrous, high and low purity, and Glauber's salt. t Gross (new and fortified). u Composite and pure. v Data for 1978 and 1979 collected by Department of Commerce; previous data collected by International Trade Commission. **na** = not available. **Sources:** Department of Commerce, International Trade Commission

Man-made fibers production

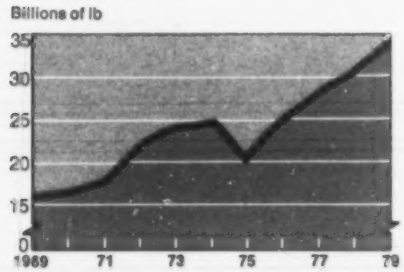


MAN-MADE FIBERS:
U.S. output tops 10 million lb for first time

Millions of lb	Production											Annual change	
	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1978–79	1969–79
CELLULOSIC FIBERS													
Acetate[a]	324	308	290	298	313	382	462	429	476	498	498	5%	−4%
Rayon	606	597	598	543	436	817	895	965	915	875	1078	2	−6
NONCELLULOSIC FIBERS													
Acrylic[b]	761	726	709	621	525	631	742	626	545	492	533	5	4
Nylon[c]	2,720	2550	2326	2075	1857	2124	2175	1974	1595	1355	1411	7	7
Olefins[d]	759	692	635	577	497	531	492	416	322	262	269	10	11
Polyester	4,178	3800	3642	3340	2995	2926	2888	2328	1142[e]	1022[e]	939[e]	10	na
Textile glass	1,012	923	787	676	546	683	688	572	468	467	501	10	7
Other	18[f]	16[f]	16[f]	14[f]	12[f]	12[f]	13[f]	11[f]	688[g]	455[g]	376[g]	12	na
TOTAL	**10,378**	**9611**	**9002**	**8144**	**7181**	**8105**	**8354**	**7322**	**6152**	**5427**	**5606**	**8%**	**6%**

a Includes diacetate and triacetate; excludes production for cigarette filtration. b Includes modacrylic. c Includes aramid. d Includes olefin yarn and monofilaments, and olefin and vinyon staple and tow. e Does not include yarn and monofilaments. f Includes only yarn and monofilaments; yarn is chiefly saran and spandex. g Includes only yarn and monofilaments; yarn includes polyester, anidex, saran, spandex, vinyon, and TFE fluorocarbon. **na** = not available. **Source:** Textile Economics Bureau

Plastics production



PLASTICS: Polyolefins lead U.S. production to a new peak

Millions of lb[a]	Production											Annual change	
	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1978–79	1969–79[b]
THERMOSETTING RESINS													
Epoxy[c]	361	299	261	244	198	249	223	184	165	165	166	21%	8%
Polyester[d]	1,147	1,209	1,061	1,042	834	911	1,051	933	730	569	688	−5	5
Urea	1,367	1,122	963	821	690	835	867	739	636	746	817	22	7
Melamine	200	202	200	186	115	164	170	171	168			−1	
Phenolic[e]	1,781	1,617	1,458	1,340	1,051	1,335	1,387	1,453	1,194	1,186	1,181	10	4
TOTAL	**4,857**	**4,448**	**3,943**	**3,631**	**2,888**	**3,494**	**3,698**	**3,481**	**2,893**	**2,666**	**2,852**	**9%**	**5%**
THERMOPLASTIC RESINS													
Polyethylene													
Low density[f]	7,793	7,111	6,471	5,813	4,743	5,973	5,803	5,274	4,458	4,240	3,880	10	7
High density[g]	5,010	4,201	3,652	3,125	2,468	2,837	2,637	2,325	1,924	1,604	1,610	19	12
Polypropylene	3,840	3,074	2,747	2,632	1,902	2,249	2,162	1,726	1,288	1,031	1,090	25	13
Polystyrene													
Acrylonitrile-butadiene-styrene	1,191	1,134	1,069	988	642	857	877	810	686[h]	566	584	5	8
Styrene-acrylonitrile	124	120	115	113	109	109	121	99	77[h]			3	
Solid (straight and rubber modified)	4,005	3,823	3,446	3,195	2,662	3,364	3,322	3,139	2,553	2,371	2,205	5	6
Styrene-butadiene copolymers and other styrene resins	916	878	813	756	585	679	703	624	433	611	555	4	5
Polyamide, nylon type	327	275	254	247	135	204	205	157	110[h]	91	92	19	14
Polyvinyl alcohol	148	127	119	123	118	142	96	62	58[h]	45	57	17	10
Polyvinyl chloride and copolymers[i]	6,119	5,723	5,253	4,716	3,648	4,850	4,562	4,259	3,471	3,115	3,032	7	7
Other vinyl resins[j]	220	197	197	225	187	209	199	194	167[h]	170	171	12	3
TOTAL	**29,693**	**26,663**	**24,136**	**21,933**	**17,159**	**21,473**	**20,687**	**18,669**	**15,225**	**13,850**	**13,276**	**11%**	**8%**

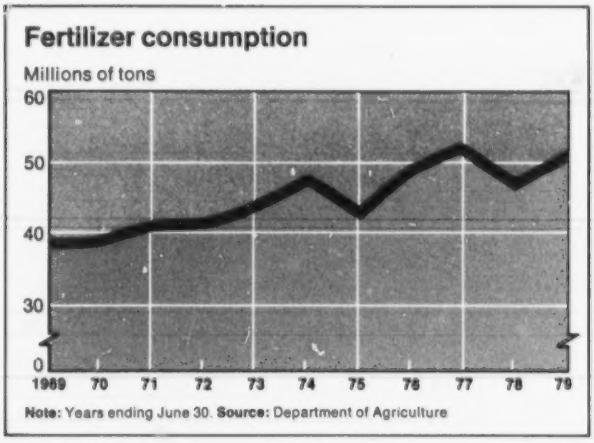
a Dry weight basis. b Annual change calculated for 1969–79 is approximate, because figures from Society of the Plastics Industry for 1979 and International Trade Commission for 1969 are not completely comparable. c Unmodified. d Unsaturated. e Includes other tar acid resins. f 0.940 density and below. g Density above 0.940. h Figure from International Trade Commission. i Dry resin content. j Includes polyvinyl butyral, polyvinyl formal, and polyvinylidene chloride. **Sources:** Society of the Plastics Industry, for years 1971 to 1979, and International Trade Commission for previous years

SYNTHETIC RUBBER: Total output up slightly despite small decline for SBR last year

Thousands of metric tons	Production											Annual change	
	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1978–79	1969–79
Styrene-butadiene rubber[a]	1378	1395	1395	1333	1179	1465	1536	1500	1440	1352	1425	−1%	0%
Polybutadiene	397	378	361	352	290	310	337	300	258	284	267	5	4
Butyl	194	154	149	125	80	165	160	131	108	120	132	26	4
Nitrile	75	73	70	73	55	88	84	74	66	68	70	3	1
Polychloroprene	183	161	165	165	144	163	na	na	na	na	na	14	na
Ethylene-propylene	175	174	158	130	84	126	120	91	61	64	76	1	9
Polyisoprene	125[b]	138[b]	62	74	61	92	119	134	119	122	111	−9	0[e]
Other[c]			56	51	47	88	270[d]	227[d]	226[d]	221[d]	204[d]		
TOTAL	**2528**	**2475**	**2418**	**2304**	**1941**	**2498**	**2626**	**2457**	**2277**	**2232**	**2286**	**2%**	**1%**

a Excludes high-styrene latex (more than 45% styrene). b Separate polyisoprene production figure unavailable; only one producer in 1978 and 1979, and figures withheld to avoid disclosing company data. c Excludes polyurethane rubber. d Includes polychloroprene (neoprene). e Annual change for 1969–79 calculated by comparing polychloroprene plus polyisoprene and other in 1979 with polyisoprene and other (including polychloroprene) in 1969. na = not available. **Sources:** Rubber Manufacturers Association, Department of Commerce

Fertilizer use rebounded last year to almost match 1977's peak



Note: Years ending June 30. **Source:** Department of Agriculture

FERTILIZERS: Sharp increases in nitrogen and phosphate exports spur U.S. production . . .

Thousands of tons	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Annual change 1978–79	Annual change 1969–79
NITROGEN (N)													
Domestic production	11,229	10,466	10,789	10,572	9343	10,094	9447	8971	8924	8321	7869	7%	4%
Imports	2,159	1,866	1,842	1,218	1198	1,068	882	843	929	855	690	16	12
Exports	2,468	1,778	1,251	1,239	1115	1,269	1508	1032	1077	1328	1594	39	4
Domestic supply	10,920	10,554	11,380	10,551	9426	9,893	8821	8782	8776	7848	6965	3	5
PHOSPHATE (P_2O_5)													
Domestic production	9,432	8,245	7,793	7,199	7230	6,869	6387	6150	5736	5520	5096	14	6
Imports	236	229	245	221	274	315	312	326	283	273	183	3	3
Exports	3,848	3,290	2,501	2,175	1860	1,581	1422	1102	898	845	995	17	14
Domestic supply	5,820	5,184	5,537	5,245	5644	5,603	5277	5374	5121	4948	4284	12	3
POTASH (K_2O)													
Domestic production	2,519	2,176	2,584	2,313	2287	2,604	2690	2432	2490	2430	2742	16	−1
Imports	5,083	4,948	4,955	3,910	3847	4,114	3192	3088	2510	2646	1977	3	10
Exports	999	1,003	994	911	848	947	922	657	620	681	787	0	2
Domestic supply	6,603	6,121	6,545	5,312	5286	5,771	4960	4863	4380	4395	3932	8	5

. . . as do more-than-average increases in consumption on the part of U.S. farmers

Thousands of tons	Consumption 1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Annual change 1978–79	Annual change 1969–79
TYPE													
Mixed fertilizer	23,639	22,110	24,099	22,958	20,647	24,067	22,547	21,511	21,513	20,961	21,234	7%	1%
Primary nutrient material	25,313	23,511	24,999	23,935	19,959	20,897	19,275	18,385	18,389	17,331	16,380	8	4
Secondary and micronutrients	2,080	1,877	2,525	2,296	1,878	2,130	1,466	1,310	1,216	1,297	1,334	11	5
TOTAL	**51,031**	**47,497**	**51,624**	**49,189**	**42,484**	**47,094**	**43,288**	**41,206**	**41,118**	**39,589**	**38,949**	7%	3%
PRIMARY NUTRIENT CONTENT													
Nitrogen (N)	10,643	9,965	10,647	10,412	8,601	9,157	8,295	8,022	8,134	7,459	6,958	7	4
Phosphate (P_2O_5)	5,544	5,096	5,630	5,228	4,507	5,099	5,085	4,864	4,803	4,574	4,686	9	2
Potash (K_2O)	6,216	5,526	5,834	5,210	4,453	5,083	4,649	4,327	4,231	4,036	3,892	12	5
TOTAL	**2,403**	**20,587**	**22,111**	**20,849**	**17,561**	**19,338**	**18,029**	**17,213**	**17,168**	**16,068**	**15,515**	9%	4%

Note: Years ending June 30. **Source:** Department of Agriculture

SECTION 2

FINANCES OF THE U.S. CHEMICAL INDUSTRY

Higher prices give boost to sales and profits

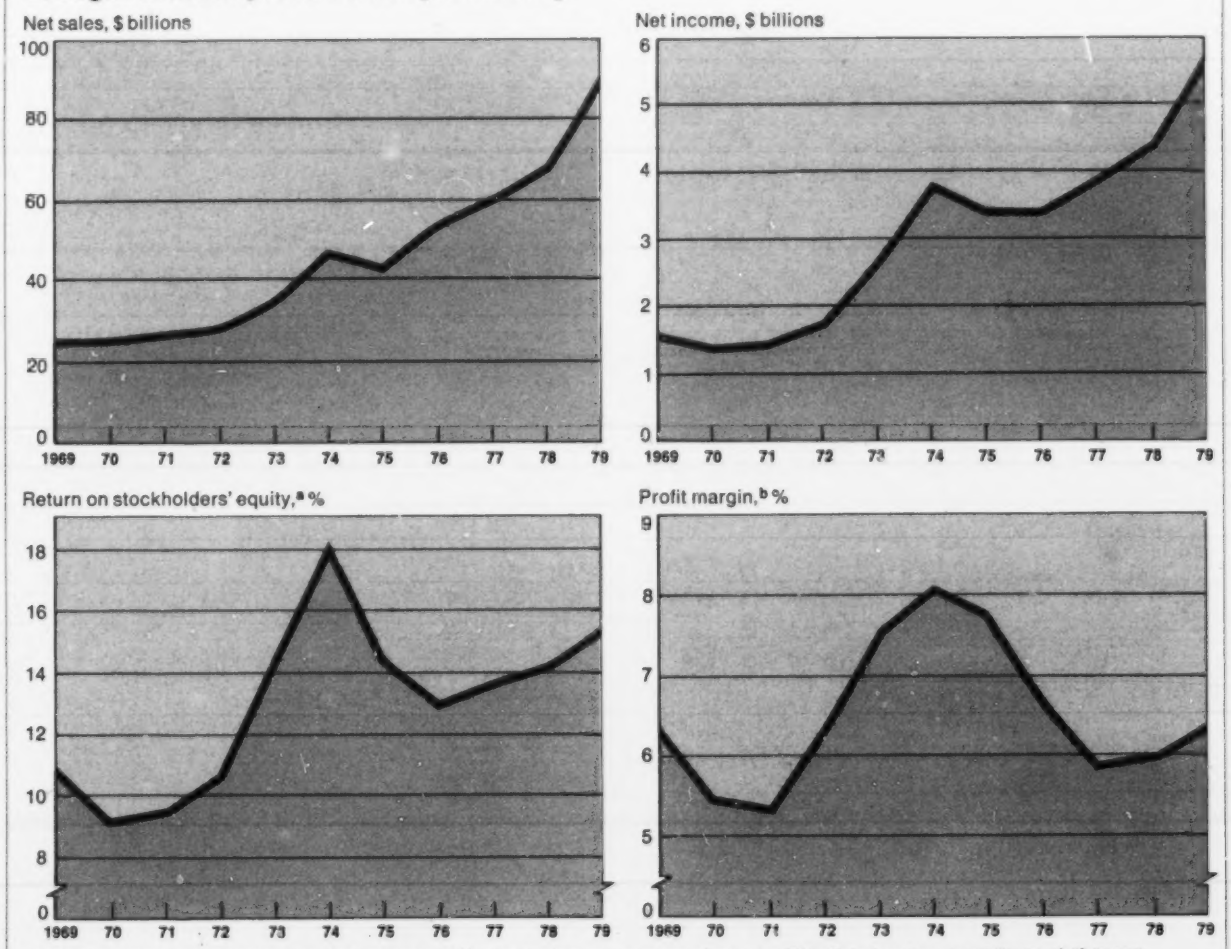
Last year turned out to be considerably better, financially, for chemical companies than most industry analysts had expected even 12 months ago. Sales in the U.S. and abroad expanded a resounding 22% for the major producers of industrial chemicals.

But the gain owes more to higher price tags on chemical products (up 17% on the year for industrial chemicals and 18% for plastics materials) than to higher physical volume, as producers tried to pass sharply increased expenses for feedstocks and energy supplies along to their customers.

Chemical companies also managed to bring a bigger share of their sales down to the bottom line; profits soared nearly 30%, the best increase in the past five years. More to the point, profitability also improved. Profit margins and return on equity remain well below what they had been in the mid-1970's, but at least the trend was upward.

But perhaps not for long. Although the first quarter of 1980 was strong, the gathering U.S. recession is sure to squeeze profits severely during the rest of the year.

Hefty gains in chemical companies' sales and earnings last year brought some improvement in profitability



a After-tax earnings as percentage of stockholders' equity. b After-tax earnings as percentage of net sales. **Note:** Data based on annual figures of 40 largest industrial chemical companies.

TOP 50 CHEMICAL PRODUCERS: Petroleum refiners score some big gains in chemicals

Rank 1979	Rank 1978[a]	Company	Chemical sales 1979 ($ millions)	Change from 1978	Total sales 1979 ($ millions)	Chemical sales as % of total sales	Industry classification	TOTAL COMPANY Net income ($ millions)	Profit margin[b] Per cent 1979	Profit margin[b] Rank 1979	Profit margin[b] Rank 1978	Return on stockholders' equity[c] Per cent 1979	Return on stockholders' equity[c] Rank 1979	Return on stockholders' equity[c] Rank 1978
1	1	Du Pont	$9700	20%	$12,572	77%	Basic chemicals	$ 938.9	7.5%	13	10	18.0%	14	9
2	2	Dow Chemical	6634	33	9,255	72	Basic chemicals	783.9	8.5	7	8	20.1	7	6
3	5	Exxon	5807	44	79,106	7	Petroleum	4295.2	5.4	29	32	19.0	11	19
4	3	Union Carbide	5300[d]	14	9,177	58	Basic chemicals	556.2	6.1	22	23	13.8	34	35
5	4	Monsanto	5215	21	6,193	84	Basic chemicals	331.0	5.3	30	16	11.9	40	32
6	7	Celanese	3010	23	3,146	96	Basic chemicals	141	4.5	37	35	13.6	36	31
7	6	W. R. Grace	2619[d]	2	5,267	50	Specialty chemicals	222.6	4.2	38	37	14.2	33	29
8	8	Shell Oil	2599	37	14,431	18	Petroleum	1125.6	7.8	11	11	16.1	23	23
9	11	Gulf Oil	2437[d]	43	23,910	10	Petroleum	1322	5.5	26	34	15.2	28	39
10	9	Allied Chemical	2150	16	4,332	50	Basic chemicals	175.6	4.1	39	22	14.3	32	30
11	10	Hercules	2039	19	2,345	87	Basic chemicals	172.5	7.4	14	20	18.2	13	26
12	12	Occidental Petroleum	1994[d]	20	9,555	21	Petroleum	561.6	5.9	26	49	33.0	1	48
13	15	Standard Oil (Ind.)	1958	50	18,610	11	Petroleum	1506.6	8.1	9	13	18.0	15	14
14	20	Phillips Petroleum	1693	52	9,503	20	Petroleum	891.1	9.4	5	5	20.9	6	4
15	13	American Cyanamid	1685[d]	18	3,187	53	Basic chemicals	168.5	5.3	31	19	12.5	39	28
16	21	Atlantic Richfield	1662	52	16,234	10	Petroleum	1165.9	7.2	15	14	19.1	10	12
17	14	Eastman Kodak	1576	17	8,028	20	Photographic equipment	1000.8	12.5	2	2	18.6	12	5
18	16	Stauffer Chemical	1496	15	1,526	98	Basic chemicals	136.0	8.9	6	6	16.0	25	8
19	19	Rohm & Haas	1479	30	1,590	93	Basic chemicals	95.5	6.0	23	31	15.0	29	38
20	31	Tenneco	1470[d]	82	11,209	13	Petroleum	571	5.1	32	21	15.4	26	17
21	17	Borden	1454[d]	16	4,313	34	Dairy products	134.0	3.1	42	38	11.3	41	25
22	18	Ethyl Corp.	1440[d]	17	1,657	87	Specialty chemicals	97.5	5.9	25	17	16.1	24	13
23	23	Mobil	1325	32	44,721	3	Petroleum	2007.2	4.5	36	39	19.1	9	27
24	22	Diamond Shamrock	1234	23	2,357	52	Basic chemicals	178.1	7.6	12	9	17.5	17	11
25	33	U.S. Steel	1207	58	12,929	9	Steel	(293.0)[e]	—	—	—	—	—	—
26	24	FMC	1135	14	3,307	34	Farm and construction machinery	151.6	4.6	35	26	13.1	38	21
27	25	Air Products[f]	1062	16	1,230	86	Basic chemicals	97.5	7.9	10	12	17.2	18	10
28	37	Texaco	1047	53	38,350	3	Petroleum	1759.1	4.6	34	41	16.5	21	42
29	30	BASF Wyandotte	1045	28	1,103	95	Basic chemicals	9.7	0.9	48	40	3.7	47	36
30	29	Standard Oil of Calif.	1043	26	29,948	3	Petroleum	1784.7	6.0	24	28	19.2	8	20
31	28	B. F. Goodrich	1041	21	2,988	35	Rubber products	82.6	2.8	44	42	9.2	44	43
32	26	Ashland Oil	1017	15	6,474	16	Petroleum	186.4	2.9	43	45	17.5	16	40
33	27	PPG Industries	972	10	3,092	31	Glass products	218.9	7.1	16	27	16.4	22	34
34	38	American Hoechst	968	42	1,174	82	Basic chemicals	30	2.6	45	45	na	—	—
35	32	Mobay Chemical	955	23	955	100	Basic chemicals	58.1	6.1	21	30	16.8	20	24
36	39	Union Oil of Calif.	865	28	7,568	11	Petroleum	500.6	6.6	17	15	16.9	19	15
37	41	Ciba-Geigy	844	27	1,320	64	Specialty chemicals	na	na	—	—	na	—	—
38	42	Williams Cos.	840	27	1,850	49	Agricultural chemicals	69.5	3.8	41	48	9.3	43	47
39	34	Olin	823	15	1,778	46	Basic chemicals	71.2	4.0	40	36	9.6	42	41
40	35	Reichhold Chemicals	794	14	875	91	Basic chemicals	12.2	1.4	47	47	6.2	46	45
41	42	Conoco	792	32	12,648	6	Petroleum	815.4	6.3	19	29	21.6	5	16
42	36	International Minerals[g]	780	12	1,475	53	Agricultural chemicals	120.8	8.2	8	7	15.3	27	7
43	40	National Distillers	773	16	2,115	37	Alcoholic beverages	135.8	6.4	18	24	13.3	37	37
44	44	Lubrizol	725	24	725	100	Specialty chemicals	90.8	12.5	1	1	24.2	2	2
45	48	Dow Corning	610	27	610	100	Specialty chemicals	71.5	11.7	3	3	21.8	4	3
46	50	Borg-Warner	595	26	2,717	22	Automobile equipment	155.6	5.7	27	18	14.4	31	18
47	49	Nalco Chemical	579	22	579	100	Specialty chemicals	63.3	10.9	4	4	24.2	3	1
48	46	Akzona	576	11	1,012	57	Basic chemicals	25.6	2.5	46	43	7.9	45	44
49	47	Pennwalt	562	17	1,079	52	Basic chemicals	50.0	4.6	33	25	13.7	35	22
50	45	NL Industries	537	1	1,810	30	Basic chemicals	114.6	6.3	20	33	14.7	30	33

a Revised. b Net income as a percentage of net sales. c Net income as a percentage of net worth. d Chemical sales include significant amounts of nonchemical products, such as fabricated plastics, coatings, metals, minerals, and the like. e Deficit. f For the year ended Sept. 30. g For the year ended June 30. na = not available. **Note:** Industry classifications are based largely, but not entirely, on the federal Enterprise Standard Industrial Classification system.

SHIPMENTS: Chemical sales totaled close to $150 billion last year

$ Billions	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Annual change 1978–79	Annual change 1969–79
All manufacturing industries	$1692.0	$1496.6	$1330.1	$1185.7	$1039.4	$1017.9	$875.4	$756.5	$671.1	$634.0	$642.5	13%	10%
Chemicals and allied products	149.2	126.4	113.9	104.1	89.7	83.7	65.0	57.4	50.9	48.5	47.4	18	12
Industrial chemicals[a]	51.8	42.4	39.1	35.6	29.4	26.6	19.0	16.6	14.9	14.5	14.2	22	14
Drugs, soap, and toiletries	40.2	34.1	30.5	27.8	24.3	22.2	19.3	17.8	15.9	15.1	14.0	18	11
Petroleum and coal products	134.0	103.6	95.7	82.3	69.5	58.9	34.9	28.7	26.9	24.9	24.4	29	19
Rubber and plastics products, nec	44.7	39.9	37.0	31.8	27.2	27.9	24.4	20.9	17.8	16.1	16.3	12	11
Paper and allied products	66.0	57.7	52.4	48.2	41.7	41.8	32.8	28.3	25.5	24.8	24.4	14	10

a Excluding pigments. nec = not elsewhere classified. **Source:** Department of Commerce

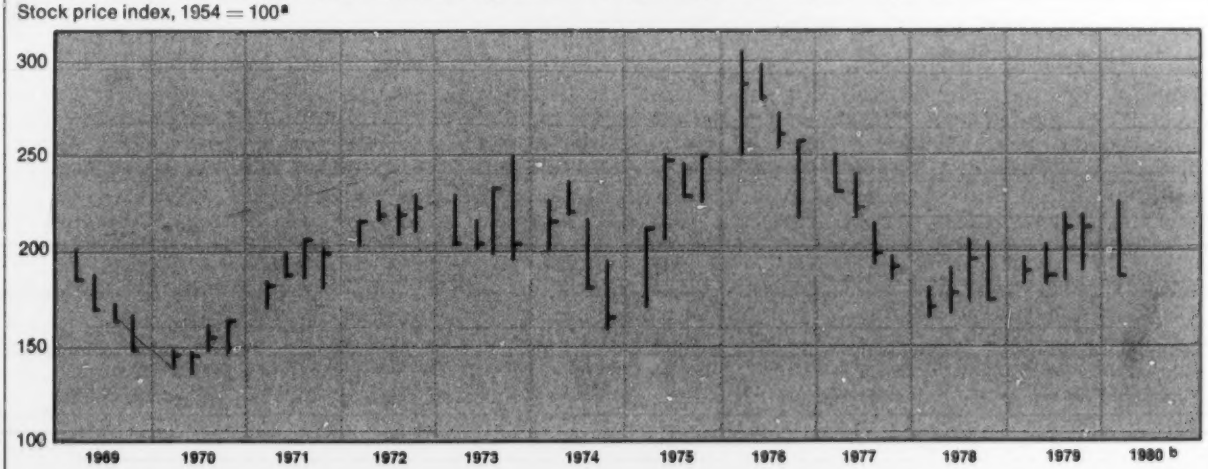
PRICES: Industrial chemicals and plastics ring up sharp increases

Producer price indexes,[a] 1967 = 100	Annual average 1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Annual change 1978–79	Annual change 1969–79
All commodities	235.6	209.3	194.2	183.0	174.9	160.1	134.7	119.1	114.0	110.4	106.5	13%	8%
Industrial commodities	236.5	209.4	195.1	182.4	171.5	153.8	125.9	117.9	114.1	110.0	106.0	13	8
Chemicals and allied products	222.3	198.8	192.8	187.2	181.3	146.8	110.0	104.2	104.1	102.2	99.9	12	8
Industrial chemicals	264.0	225.6	223.9	219.3	206.9	151.7	103.4	101.2	102.0	100.9	100.3	17	10
Prepared paint	204.4	192.3	182.4	174.4	166.9	145.7	122.2	118.0	115.6	112.4	109.1	6	6
Paint materials	241.2	212.7	205.9	189.8	177.2	152.3	113.2	104.1	101.5	101.4	102.1	13	9
Drugs and pharmaceuticals	159.4	148.1	140.5	134.0	126.6	112.7	104.3	103.0	102.4	101.2	99.9	8	5
Fats and oils, inedible	376.7	315.8	279.0	249.9	255.2	338.2	228.3	115.8	133.6	132.8	109.1	19	13
Agricultural chemicals and chemical products	214.4	198.4	187.8	188.4	203.6	137.7	96.6	91.7	92.1	88.5	86.7	8	9
Plastic resins and materials	235.9	199.8	195.7	194.0	180.9	143.8	92.1	88.7	88.7	90.6	90.4	18	10
Other chemicals and allied products	191.8	181.8	175.7	170.7	168.6	147.5	118.1	113.5	112.0	108.6	104.2	6	6
Rubber and plastic products	194.3	174.8	167.6	159.2	150.2	136.2	112.4	109.3	109.1	108.3	105.3	11	6

a Formerly called "wholesale price indexes." **Source:** Department of Labor

Chemical stocks have made little progress during the past couple of years

Stock price index, 1954 = 100[a]



a C&EN weighted stock price index of Allied Chemical, American Cyanamid, Celanese, Dow Chemical, Du Pont, Monsanto, and Union Carbide; weighted according to number of shares outstanding for each company. b First quarter.

INDUSTRY BALANCE SHEET: Chemical firms' current liabilities are sharply higher

Industrial chemicals and synthetics

Assets	1979 ($ billions)	1978 ($ billions)	Change
Current assets:			
Cash and time deposits	$ 1.20	$ 0.99	22%
Marketable securities	0.90	0.91	−1
Receivables	10.79	9.56	13
Inventories	9.23	8.24	12
Other current assets	1.75	1.34	30
Total	**23.87**	**21.03**	**13**
Fixed assets:			
Plant, property, and equipment	57.97	53.42	9
Less: accumulated depreciation and depletion	28.22	26.13	8
Net fixed assets	**29.76**	**27.29**	**9**
Other assets:			
Investments, intangibles, etc.	**11.20**	**9.25**	**21**
TOTAL ASSETS	**$64.82**	**$57.57**	**13%**

Liabilities and stockholders' equity	1979 ($ billions)	1978 ($ billions)	Change
Current liabilities:			
Accounts payable	$ 5.02	$ 4.26	18%
Short-term loans	1.60	1.07	50
Income taxes	1.15	1.13	1
Current portion of long-term debt	0.60	0.46	32
Other current liabilities	4.77	3.26	46
Total	**13.14**	**10.18**	**29**
Long-term debt	**14.64**	**13.65**	**7**
Deferred taxes and other noncurrent liabilities	**4.81**	**4.21**	**14**
Minority interest	**0.29**	**0.23**	**26**
TOTAL LIABILITIES	**$32.87**	**$28.27**	**16%**
Stockholders' equity:			
Capital stock and other capital	9.37	9.18	2
Retained earnings	23.32	20.81	12
Less: Treasury stock	0.74	0.70	7
TOTAL STOCKHOLDERS' EQUITY	**$31.95**	**$29.29**	**7%**
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	**$64.82**	**$57.57**	**13%**

Source: Federal Trade Commission

DEBT RATIOS: Changes have been slight for the past five years

$ Billions	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969
INDUSTRIAL CHEMICALS AND SYNTHETICS											
Long-term debt	$14.6	$13.6	$12.3	$11.8	$10.2	$7.8	$7.2	$7.6	$7.6	$7.0	$6.4
Stockholders' equity	$32.0	$29.3	$26.3	$25.0	$22.8	$20.5	$18.7	$18.5	$17.5	$16.2	$15.6
Debt ratio[a]	31.4%	31.8%	31.9%	32.0%	30.8%	27.6%	27.8%	29.2%	30.3%	30.1%	29.2%
DRUGS											
Long-term debt	$3.0	$2.8	$2.6	$2.4	$2.3	$1.7	$1.3	$1.4	$0.9	$1.2	$0.9
Stockholders' equity	$13.9	$12.1	$10.9	$10.3	$9.3	$8.1	$7.5	$7.7	$6.3	$7.1	$6.3
Debt ratio[a]	21.7%	18.7%	19.2%	19.1%	19.6%	17.6%	14.3%	15.0%	12.5%	14.8%	11.9%
CHEMICALS AND ALLIED PRODUCTS											
Long-term debt	$24.6	$23.5	$21.1	$19.4	$16.8	$12.8	$10.7	$11.5	$10.7	$10.0	$9.1
Stockholders' equity	$66.9	$60.8	$54.9	$50.8	$45.7	$40.9	$36.7	$36.1	$32.8	$30.6	$28.6
Debt ratio[a]	26.9%	27.9%	27.8%	27.6%	26.9%	23.8%	22.6%	24.2%	24.6%	24.6%	24.0%
ALL MANUFACTURING											
Long-term debt	$204.0	$182.0	$167.3	$153.6	$145.2	$130.1	$112.9	$118.3	$111.5	$102.5	$90.7
Stockholders' equity	$623.5	$560.8	$511.7	$475.3	$435.5	$408.4	$368.0	$353.1	$327.1	$310.8	$297.1
Debt ratio[a]	24.7%	24.5%	24.6%	24.4%	25.0%	24.2%	23.5%	25.1%	25.4%	24.8%	23.4%

a Long-term debt as a percentage of long-term debt plus stockholders' equity. **Note:** Because of sampling changes, numbers over the entire range of years are not strictly comparable. **Source:** Federal Trade Commission

CASH FLOW: Profits rise, debt declines as a source of corporate funds

$ Million, % of total	1979		1978		1977		1976		1975	
SOURCES OF FUNDS										
Net income	$3,800.6	36.3%	$3085.4	33.6%	$2754.0	30.6%	$2855.3	32.9%	$2427.1	29.9%
Depreciation and depletion	3,601.8	34.4	3197.0	34.8	2832.7	31.5	2420.1	27.9	2155.2	26.6
Deferred taxes	426.7	4.1	353.4	3.8	356.6	4.0	373.9	4.3	416.6	5.1
Other internal sources	1,093.3	10.5	929.6	10.1	1214.4	13.5	666.4	7.7	591.0	7.3
Long-term debt	1,209.6	11.6	1544.5	16.8	1609.1	17.9	2219.5	25.6	2333.3	28.8
Stock	321.9	3.1	83.8	0.9	229.9	2.5	142.9	1.6	187.7	2.3
TOTAL	**$10,453.9**	**100.0%**	**$9193.7**	**100.0%**	**$8996.7**	**100.0%**	**$8678.1**	**100.0%**	**$8110.9**	**100.0%**
APPLICATION OF FUNDS										
Dividends	$1,474.2	14.1%	$1317.1	14.3%	$1183.5	13.1%	$1054.9	12.1%	$ 924.1	11.4%
Capital expenditures	5,632.7	53.9	5080.4	55.3	5488.0	61.0	5701.6	65.7	5191.8	64.0
Additions to working capital	1,075.0	10.3	863.1	9.4	520.2	5.8	545.3	6.3	714.3	8.8
Reduction of long-term debt	1,042.4	10.0	878.7	9.5	746.5	8.3	728.3	8.4	742.7	9.2
Other applications	1,229.6	11.7	1054.4	11.5	1058.5	11.8	648.0	7.5	538.0	6.6
TOTAL	**$10,453.9**	**100.0%**	**$9193.7**	**100.0%**	**$8996.7**	**100.0%**	**$8678.1**	**100.0%**	**$8110.9**	**100.0%**

Note: Data are totals for 15 major chemical companies: Allied Chemical, American Cyanamid, Celanese, Diamond Shamrock, Dow Chemical, Du Pont, Ethyl Corp., Hercules, Monsanto, Olin, Pennwalt, Rohm & Haas, Stauffer Chemical, Union Carbide, and Williams Cos. **Source:** Company annual reports

FINANCIAL ANALYSES: Profitability improved for chemical companies last year

	Profit margin[a]	Return on investment[b]	Debt as % of debt plus equity	% total sales abroad[c]	% total assets abroad[d]	Sales per employee[e]	Dividends as % of net income	CAPITAL SPENDING[f] as % of sales	CAPITAL SPENDING[f] as % of net plant	R&D spending as % of sales	Sales as % of assets	Net plant as % of gross plant
SALES OVER $1 BILLION												
Air Products[g]	7.9%	4.9%	34.9%	22.0%	26.1%	$ 84	18.9%	20.0%	26.0%	2.0%	86.6%	60.4%
Akzona	2.5	2.1	41.1	na	na	66	38.3	5.4	13.6	2.5	123.7	47.8
Allied Chemical	4.1	3.3	36.1	25.5	25.8	88	74.3	9.4	18.8	1.6	102.9	57.3
American Cyanamid	5.3	4.6	27.9	36.7	27.1	72	45.2	7.4	18.1	3.9	112.7	56.4
Cabot[g]	6.3	5.9	38.3	25.4	22.7	139	20.6	8.7	24.5	1.6	119.4	56.1
Celanese	4.4	3.5	33.0	21.1	19.9	96	34.8	7.7	21.3	2.9	133.9	39.3
Diamond Shamrock	7.6	6.1	41.6	11.4	12.4	189	43.2	12.8	21.9	1.8	97.5	64.6
Dow Chemical	8.5	6.2	43.9	50.5	52.6	166	34.6	13.7	24.2	2.9	90.3	58.8
Du Pont	7.5	6.0	17.4	31.7	26.0	94	43.5	7.4	23.6	3.3	140.6	35.1
Ethyl Corp.	5.9	6.7	26.8	30.6	14.8	104	30.4	7.9	25.6	1.8	145.0	56.0
B. F. Goodrich	2.8	3.0	37.5	21.1	20.6	71	31.2	4.9	17.2	1.5	143.5	49.8
W. R. Grace	4.2	5.1	34.9	29.9	23.1	64	39.1	9.1	29.3	0.9	141.2	42.8
Hercules	6.2	5.8	21.3	25.6	26.1	96	31.6	7.9	24.1	2.0	133.2	45.4
International Minerals[h]	8.2	6.3	30.0	28.1	16.3	143	41.7	11.8	11.3	0.4	95.9	67.6
Monsanto	5.3	4.1	30.2	33.1	30.7	97	36.6	9.1	20.1	2.8	111.8	51.0
National Distillers	6.4	7.8	25.5	7.4	6.6	135	39.6	2.7	11.1	na	127.1	55.9
Olin	4.0	3.5	28.4	9.0	10.5	82	32.6	9.1	21.1	1.5	121.7	52.6
Pennwalt	4.6	4.9	35.0	22.2	22.3	81	45.0	6.3	22.6	2.2	136.0	51.9
PPG Industries	7.1	5.9	25.9	18.4	14.9	81	27.7	8.1	18.6	2.7	116.7	54.2
Rohm & Haas	6.0	5.4	27.6	36.6	31.5	120	23.8	4.3	13.9	3.4	133.4	43.5
Stauffer Chemical	8.9	5.8	31.5	11.0	10.5	111	34.6	15.7	23.0	2.4	81.3	63.4
Union Carbide	6.1	4.4	30.5	30.3	28.6	79	34.2	9.1	18.6	1.8	104.2	51.1
Williams Cos.	3.8	3.1	43.1	16.0	na	na	39.0	6.1	9.5	na	92.0	74.8
MEDIAN 1979	**6.0%**	**5.1%**	**31.5%**	**25.5%**	**22.3%**	**$96**	**34.8%**	**8.1%**	**21.1%**	**2.0%**	**119.4%**	**52.6%**
MEDIAN 1978	**4.9%**	**4.4%**	**30.9%**	**20.9%**	**21.3%**	**$80**	**40.0%**	**9.1%**	**21.3%**	**2.2%**	**112.0%**	**54.0%**
SALES FROM $160 MILLION TO $1 BILLION												
Baker Industries	5.7	5.3	37.8	13.1	11.5	190	0	2.6	5.3	na	94.3	71.8
Big Three Industries	12.3	7.2	24.9	15.0	10.9	na	26.9	15.6	16.3	na	72.8	72.9
Crompton & Knowles	3.0	4.5	28.2	21.1	21.6	80	39.4	3.3	27.4	1.7	168.9	47.5
Ferro	5.2	6.7	16.7	57.2	54.3	65	12.3	5.6	28.6	0.4	151.5	58.6
First Mississippi[h]	2.6	2.0	38.5	25.4	na	209	72.3	4.2	13.4	na	90.6	43.1
Freeport Minerals	20.8	14.4	24.5	na	na	125	24.2	25.3	35.8	na	71.4	60.2
International Flavors	15.0	13.8	0	71.6	56.5	114	45.9	3.7	13.3	6.6	105.5	62.3
Liquid Air	6.7	4.6	19.5	41.9	37.9	na	58.3	13.7	19.6	1.0	88.4	64.9
Loctite[h]	14.4	18.0	15.1	42.2	51.4	64	15.9	5.4	35.9	2.4	115.2	70.2
Lubrizol	12.2	14.7	2.0	57.8	48.9	190	35.1	6.9	28.2	3.0	142.6	57.6
Mallinckrodt	10.5	11.2	14.9	14.1	na	82	24.1	5.0	15.0	3.3	117.9	63.4
Nalco Chemical	10.9	13.8	3.7	18.9	21.9	140	42.7	6.7	30.8	3.7	157.3	49.8
Petrolite[i]	8.3	8.4	12.8	21.8	20.7	104	39.1	6.4	20.1	3.0	130.4	55.0
Reichhold Chemicals	1.4	2.4	40.7	15.7	19.4	137	66.4	3.0	14.5	na	203.8	62.9
Thiokol	5.4	7.2	3.1	18.6	11.8	60	25.1	6.0	30.4	1.4	154.4	56.4
Texasgulf	17.3	7.7	28.7	37.7	43.4	134	34.3	20.9	15.9	na	47.9	77.0
Witco Chemical	4.4	6.0	32.9	16.6	16.9	na	28.0	5.0	25.1	1.2	170.7	52.4
MEDIAN 1979	**8.3%**	**7.2%**	**19.5%**	**21.5%**	**21.2%**	**$120**	**34.3%**	**5.6%**	**20.1%**	**2.7%**	**130.4%**	**60.2%**
MEDIAN 1978	**7.9%**	**6.1%**	**19.7%**	**21.4%**	**21.3%**	**$96**	**36.0%**	**5.5%**	**20.6%**	**2.7%**	**133.0%**	**60.0%**

a Net income as a percentage of sales. b Net income as percentage of current assets plus gross plant. c Consolidated sales only. d Foreign identifiable assets as percentage of total assets. e Thousands of dollars. f Actual spending on construction of new facilities and purchase of new equipment and land in consolidated businesses. g For fiscal year ended Sept. 30, 1979. h For fiscal year ended June 30, 1979. i For fiscal year ended Oct. 31, 1979. na = not available. **Note:** Net income excludes extraordinary or nonrecurring profits and earnings from discontinued operations, where possible.

INDUSTRY CAPITAL SPENDING: Totals for U.S. plant and equipment projects will rise in 1980

$ Billions	1980[a]	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Chemicals	$ 9.28	$ 8.56	$ 7.10	$ 6.83	$ 6.68	$ 6.25	$ 5.69	$ 4.46	$ 3.45	$ 3.44	$ 3.44
Food and beverage	5.28	5.06	4.87	4.18	3.75	3.26	3.25	3.11	2.55	2.69	2.84
Iron and steel	3.53	2.97	2.46	2.67	2.99	3.03	2.12	1.38	1.24	1.37	1.68
Nonferrous metals	3.12	2.61	2.45	2.24	2.16	2.28	2.33	1.67	1.18	1.08	1.24
Paper	6.01	4.88	3.46	3.36	3.27	2.95	2.58	1.86	1.38	1.25	1.65
Petroleum	19.34	16.62	15.50	13.87	11.62	10.51	8.00	5.45	5.25	5.85	5.62
Rubber	1.74	1.80	1.75	1.45	1.10	1.00	1.47	1.56	1.08	0.84	0.94
Stone, clay, and glass	3.02	2.92	2.46	1.99	1.72	1.42	1.44	1.49	1.20	0.85	0.99
Textiles	1.02	1.06	1.04	0.92	0.81	0.66	0.84	0.77	0.73	0.61	0.56
All manufacturing	90.20	78.92	67.62	60.16	52.48	47.95	46.01	38.01	31.35	29.99	31.95

a Estimate. **Source:** Department of Commerce

Big increases also are due for capital spending of U.S. firms outside U.S.

$ Billions[a]	1980[b]	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Chemicals and allied products	$ 3.4	$ 3.2	$ 2.5	$ 2.4	$ 2.7	$ 2.5	$ 2.1	$1.4	$1.2	$1.2	$1.2
Food products	1.4	1.3	1.0	0.9	0.7	0.7	0.7	0.6	0.4	0.4	0.4
Metals, primary and fabricated	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.6	0.6	0.7
Paper and allied products	2.0	1.0	0.8	0.7	0.6	0.7	0.9	0.6	0.5	0.6	0.4
Rubber products	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.2
All manufacturing	23.9	19.2	14.6	12.7	10.9	11.3	11.6	9.2	7.2	7.0	6.5
Petroleum	15.4	12.0	10.0	9.3	7.9	8.9	7.8	6.4	5.2	5.0	4.0

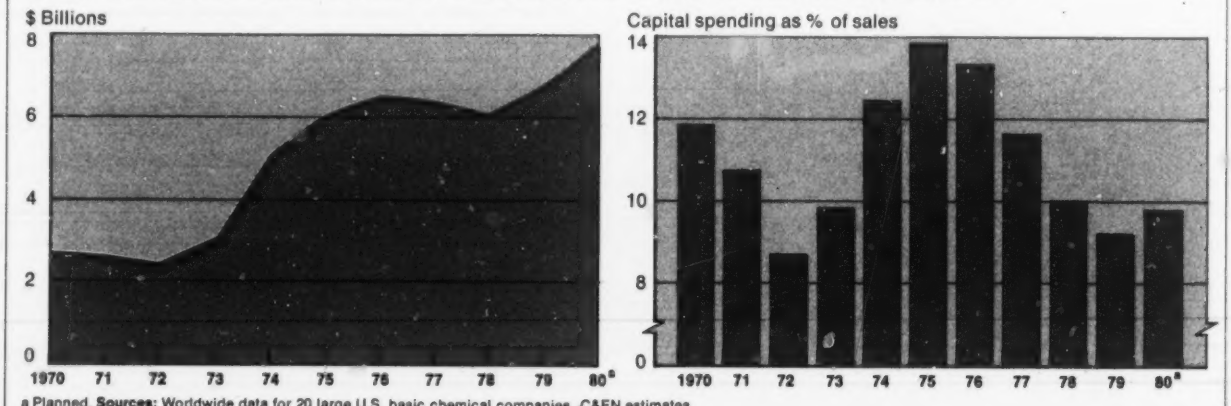
a By majority-owned affiliates of U.S. companies. b Planned. **Source:** Department of Commerce

Capital spending on pollution control projects rises again this year

	1980[a]				1979				1978			
$ Millions	Total	Air	Water	Solid waste	Total	Air	Water	Solid waste	Total	Air	Water	Solid waste
Chemicals	$ 476	$ 218	$ 205	$ 53	$ 440	$ 203	$ 184	$ 53	$ 565	$ 236	$ 286	$ 42
Food and beverage	150	51	83	16	148	61	84	13	172	175	175	22
Iron and steel	638	435	197	6	510	351	154	5	441	290	140	10
Nonferrous metals	286	187	76	23	213	142	58	13	247	189	53	5
Paper	300	[illegible]	125	40	297	133	124	40	239	105	103	31
Petroleum	1536	844	565	127	1386	708	530	147	1294	611	586	98
Rubber	58	39	14	6	62	38	12	12	58	40	12	7
Stone, clay, and glass	176	130	33	13	145	116	22	7	164	109	47	7
All manufacturing	4540	2515	1642	383	3976	2103	1493	381	3951	1992	1652	306

a Planned. **Source:** Department of Commerce

Chemical capital spending rises, but is still low compared with company sales



a Planned. **Sources:** Worldwide data for 20 large U.S. basic chemical companies, C&EN estimates

Although being struck harder and harder this year by a general economic downturn in the U.S., chemical companies are lifting their plans moderately for spending on new plant and equipment. A C&EN survey of 20 leading companies finds that latest company plans add up to a 16% increase in spending for 1980 worldwide over 1979. This follows a 12% gain in 1979 after small declines in outlays the previous two years.

The 16% increase now planned, if it holds up, still will not exceed the rate of inflation very much. And it will be relatively modest in relation to company sales. For 1980, capital spending will be less than 10% of sales for these 20 companies for the second straight year. Historically, spending at a rate of 9 to 10% of sales has marked the low point in capital spending cycles. By contrast, in the previous business cycle, during the boom and bust years of 1974 and 1975, capital spending exceeded 13% of sales.

In the broad U.S. chemicals and allied products industry, capital spending plans already have decelerated this year from a fairly hot pace in 1979. The Commerce Department finds the industry headed for an 8% gain for plant and equipment outlays in the U.S. after a 21% increase in 1979. The jump in 1979 came on the heels of gains of only 4% and 2%, respectively, in 1978 and 1977.

The picture for foreign affiliates of U.S. chemicals and allied products firms has changed even more dramatically. After a 28% spurt in 1979 following a rough plateau since 1975, capital spending abroad will rise merely 6% in 1980, Commerce estimates.

Spending by chemical firms on projects to control pollution seems set for a modest increase in 1980. Initial plans for antipollution spending are up 8% from 1979. Air and water sectors are each ticketed for more than 40% of the total, with the remainder going for solid waste control. However, chemical companies have tended to overstate pollution-control spending plans in initial surveys in recent years. For 1979, for instance, a 3% rise planned initially turned into a 22% drop by the end of the year.

In C&EN's capital spending survey, more than 40% of total spending in 1980 is planned by just three companies—Dow Chemical, Du Pont, and Union Carbide, each with budgets of $1 billion or more. All three are projecting substantial increases in 1980, after boosting spending solidly also in 1979. Dow has kept its spending at $1 billion or more throughout the second half of the 1970's.

CHEMICAL CAPITAL SPENDING: **Leading companies plan largest increase in five years**

$ Millions	1980[a]	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Air Products	$ 310	$ 246	$ 200	$ 143	$ 162	$ 151	$ 110	$ 67	$ 42	$ 79	$ 51
Akzona	65[b]	54	42	35	38	51	57	42	43	73	46
Allied Chemical	400	409	502	465	352	314	306	194	128	132	132
American Cyanamid	210[b]	235	251	235	232	204	139	83	72	111	94
Celanese	260	245	248	243	223	208	220	159	128	169	135
Diamond Shamrock	315[b]	257	319	389	334	183	201	103	61	56	53
Dow Chemical	1400	1268	1075	1163	1200	935	890	415	359	365	348
Du Pont	1000	864	714	704	876	1036	1008	781	561	474	499
Ethyl Corp.	115	123	96	89	88	69	75	35	32	24	50
W. R. Grace	600	408	285	275	233	309	303	174	135	98	105
Hercules	185	186	116	127	150	151	217	144	80	53	91
International Minerals	300[b]	174	194	175	165	165	97	22	15	18	14
Monsanto	680	566	480	607	647	528	313	205	168	205	301
Olin	140	161	163	208	166	99	67	78	76	55	60
Pennwalt	65	67	62	46	40	32	43	25	22	23	33
PPG Industries	350	252	261	212	177	176	205	136	98	155	173
Rohm & Haas	100	68	66	79	110	106	106	73	62	85	62
Stauffer Chemical	265[b]	239	201	193	199	199	83	45	35	52	47
Union Carbide	1000	831	688	805	965	862	517	289	244	335	394
Williams Cos.	190	113	132	205	204	271	261	92	38	41	23
TOTAL	**$7950**	**$6836**	**$6095**	**$6398**	**$6561**	**$6049**	**$5218**	**$3162**	**$2399**	**$2603**	**$2711**
ANNUAL CHANGE	**16%**	**12%**	**−5%**	**−2%**	**8%**	**16%**	**65%**	**32%**	**−8%**	**−4%**	**7%**

a Planned. b C&EN estimate. **Note:** Figures are for worldwide spending on construction, equipment, and land in consolidated businesses. Where possible, acquisition costs and investments in nonconsolidated businesses are excluded. **Source:** Company data

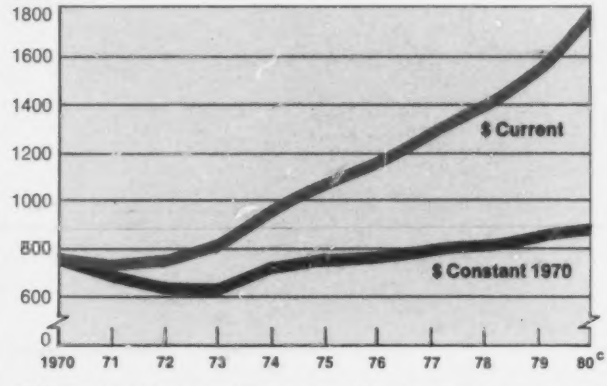
Research and development is getting strong support from U.S. chemical producers in 1980, just as it did in 1979. R&D budgets at 14 leading chemical companies are up 13%. The gain outstrips the likely inflation in R&D costs, estimated by Battelle Columbus Laboratories at 10.7% this year, and so may well lead to further increases in professional staffing.

This year's increase follows one—also of 13%—in 1979. In 1979, too, spending went up faster than R&D inflation, making the job market a good one for scientists and engineers.

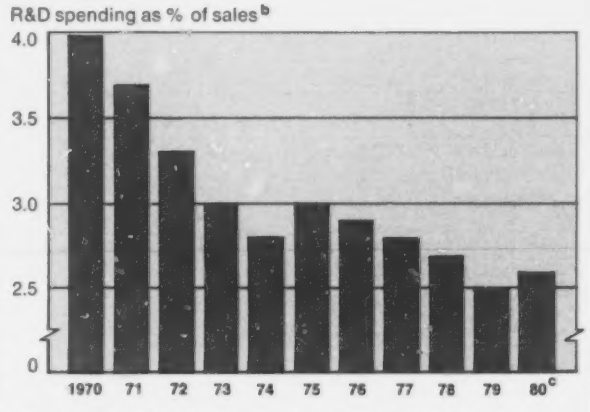
R&D outlays also may capture a larger share of the sales dollar this year as well, rising to 2.6% of sales from 2.5% in 1979. The change is small, but it will be the first increase in the percentage since 1975. Generally, R&D expenditures by chemical companies have been shrinking relative to sales during the past decade as chemical prices have been rising at a faster pace than have R&D costs.

The biggest spenders on R&D in the chemical industry are planning substantial increases in 1980. At Du Pont, biggest of all, a reorganized R&D effort will get an estimated $480 million, up from $415 million in 1979.

R&D outlays in the chemical industry rise slightly ahead of inflation . . .



. . . but remain relatively low as a percentage of total sales



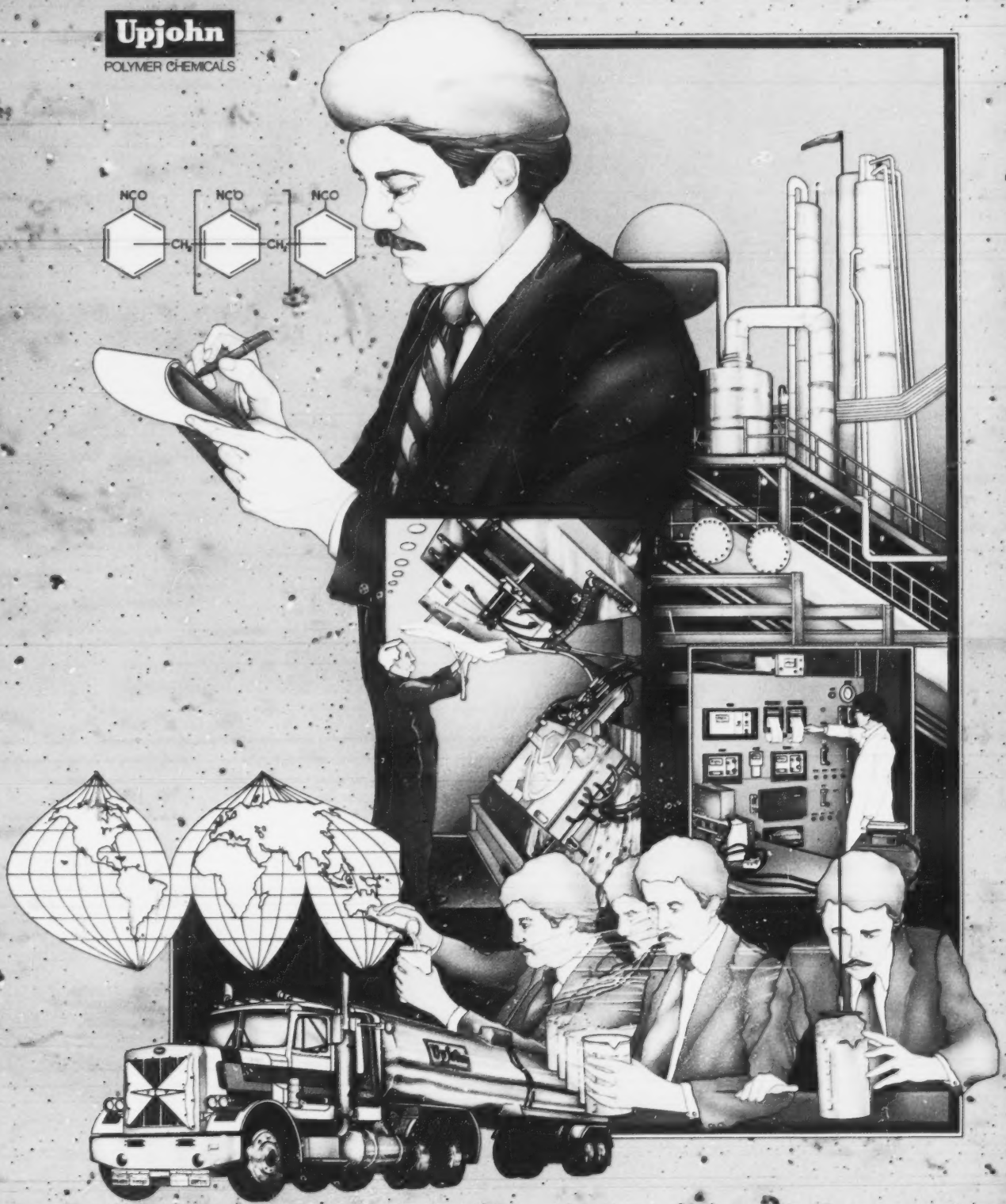
a R&D spending by basic chemical companies. b By basic chemical companies. c Estimate. **Sources:** Worldwide data from 14 U.S. basic chemical companies, Battelle Columbus Laboratories, C&EN estimates

CHEMICAL R&D SPENDING: Large companies are planning some sizable increases in 1980

$ Millions	1980[a]	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Air Products	$ 27	$ 23	$ 23	$ 24	$ 19	$ 16	$ 11	$ 8	$ 7	$ 7	$ 5
Akzona	29	25	23	20	18	17	16	13	11	10	7
Allied Chemical	75	70	56	51	40	35	31	29	29	31	29
American Cyanamid	140	124	108	96	83	73	64	52	44	43	47
Celanese	100	92	83	77	70	64	56	49	52	51	55
Diamond Shamrock	50	42	36	29	24	20	14	12	12	11	11
Dow Chemical	310[b]	269	232	203	188	167	149	118	105	95	92
Du Pont	480	415	377	367	353	336	344	286	265	259	270
Ethyl Corp.[c]	na	29	25	28	25	19	25	22	20	20	18
W. R. Grace	50	46	41	34	30	30	32	28	22	21	21
Hercules	53	47	40	37	35	30	30	25	24	22	22
Monsanto[d]	195	174	144	132	114	116	87	82	92	87	98
Olin[e]	na	26	25	25	25	24	19	18	16	8	8
Pennwalt[d]	na	24	23	21	19	16	14	13	18	17	18
Rohm & Haas	62	54	49	45	43	45	39	32	25	29	31
Stauffer Chemical	45	37	34	33	29	24	20	17	14	14	14
Union Carbide	174	161	156	156	142	120	94	77	70	78	78
TOTAL[f]	$1790	$1579	$1402	$1304	$1188	$1093	$989	$828	$772	$758	$780
ANNUAL CHANGE[f]	13%	13%	8%	10%	9%	11%	19%	7%	2%	−3%	1%

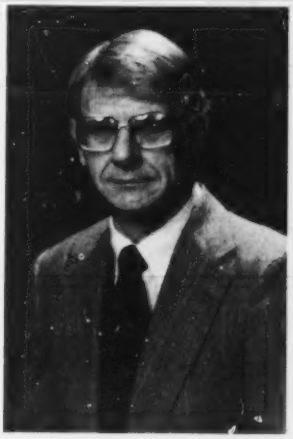
a Planned. b C&EN estimate. c R&D definition narrowed after 1974. d R&D definition narrowed after 1972. e For chemicals only before 1972. f For 14 companies only. **na** = not available. **Sources:** Company data, C&EN estimates

Upjohn
POLYMER CHEMICALS



Polyurethane '80

The Americas



Eugene D. Eike
Director, North & South American Business

Raw Materials and Energy

Times are changing. The polymeric isocyanate industry used to be a minor user of petrochemical raw materials. However, our supply requirements increased dramatically in the last decade and will continue to grow in the years to come.

Looking ahead, the polymeric MDI isocyanates industry will be dependent on OPEC, like much of the chemical industry. Although the chemical industry consumes only five to six percent of U.S. oil, international crises make it difficult to accurately predict the oil supply for the coming decade.

Most energy outlooks are based on declining oil and gas supplies through the '80s, as nuclear, synfuels and coal take up the slack. Synfuels from coal are predicted to emerge as a viable alternative in the mid-'80s.

Benzene—the most important polymeric MDI raw material—accounts for approximately 40 percent of isocyanate raw material costs. The price of benzene has risen dramatically, squeezing MDI profit margins.

After the 1973-74 shortage, benzene prices stabilized between 70 cents and 80 cents per gallon for three years. Then, due to OPEC price increases and tight supply, prices soared to $1.75 per gallon in 12 months and will probably exceed $2.00 per gallon this year, reaching $3.00 a gallon by 1983-84.

Only five to six percent of the total supply of benzene goes into polymeric isocyanate. The competing demand for gasoline and OPEC prices—not the isocyanate industry—primarily influence benzene prices. And demand for more unleaded gasoline will require more aromatics like benzene, even though total gasoline consumption is predicted to decline in the early '80s. Furthermore, demand for toluene as an octane booster—a function formerly performed by lead and manganese additives, now banned or greatly reduced by action of the federal government—diverts toluene from benzene production.

New gasoline additives, such as MTBE (methyl tertiary butyl ether) and TBA (tertiary butyl alcohol), will not be sufficiently available to offset banned lead and manganese additives. MTBE also reduces the supply of methanol, the major raw material used in making formaldehyde—another polymeric isocyanate raw material. Methanol demand will tighten supply and boost prices, particularly as there is little incentive to build the needed methanol capacity as supply of natural gas—the primary raw material source for methanol—is limited.

The other major raw materials, chlorine and caustic, are energy intensive. Thus, all the major raw materials are highly dependent on energy or fuel costs. With no relief in sight from the government or OPEC, the price of polymeric MDI isocyanate must follow the escalating costs of energy and fuel.

James Burt
Group Manager, North & South American Sales

Versatility Spurs Growth

The past 10 years were a decade of remarkable growth for the entire polyurethane industry, setting the standard by which other plastics industries could judge their performance.

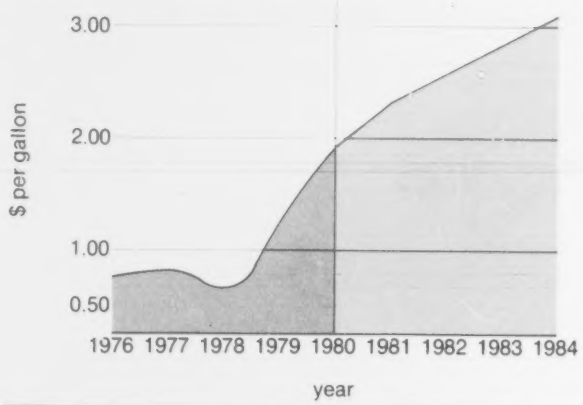
Energy conservation accelerated the use of polyurethane and isocyanurate foam insulation in new residential as well as commercial applications. An entirely new market area developed—namely the "retrofit" market—as insulating values were upgraded on existing structures using rigid foam insulation.

Ten years ago, RIM elastomer technology did not exist. Today it is one of the fastest growing, most exciting developments in the entire plastics industry. We can expect to see current producers of RIM parts expand in the '80s and introduce many forward-thinking new entries in the marketplace.

During the '70s, skateboards with cast or injection-molded polyurethane elastomer wheels were "in." By the end of the decade, declining skateboard sales were completely offset by the resurgence of roller skating. It's just one example demonstrating that if a product is versatile—and the polyurethanes certainly are—and the application has merit, a successful marketing venture often results.

We at Upjohn Polymer Chemicals view the '80s as a challenging opportunity... to develop new materials and to meet the ever-changing markets for these versatile products known as the polyurethanes.

Benzene Prices ($ per gallon)



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Dr. Peter J. Manno
Manager, Market Research & Commercial Development

Outlook for Polyurethane Markets

U.S. and Canadian demand for polyurethanes continues to escalate, particularly in the transportation and construction industries, fueled by energy conservation.

The next decade looks encouraging. Further energy conservation measures demand insulation with polyurethane. Exteriors of small, fuel-efficient automobiles will require liberal amounts of polyurethane elastomers. And new polyurethane applications will generate additional U.S. and Canadian demand that may well exceed five billion pounds (2.3 million tons).

United States

National demand for polyurethane increased approximately 12 percent a year during the last decade, as flexible foam cushioning expanded furniture and transportation markets, and demand for energy-saving polyurethane rigid foam insulation grew. Total U.S. demand will reach 2,580 million pounds in 1980, despite any business recession or strain on production capacity.

The '80s appear promising for polyurethane products; estimated overall demand may approach 4.9 billion pounds, as shown in Figure 1.

Flexible foam will continue to dominate polyurethane end uses. Its superior cushioning properties will maintain a nearly total penetration of furniture and transportation markets. Bedding applications may account for 30 percent of mattress units by 1990.

Rigid foam uses will average a nine percent annual increase and reach 1,620 million pounds by 1990—primarily due to growing demand for rigid foam insulation for building and construction.

Demand for polyurethane elastomers will double during the '80s and reach 550 million pounds. Transportation will account for 60 percent of the projected increase, as U.S. auto manufacturers comply with federal fuel economy standards. Other polyurethane elastomers will be chosen for high-performance applications requiring superior wear and resistance to corrosion and abrasion.

Coatings, adhesives and sealants are projected to grow a record 12 percent per year during the coming decade. Polyurethane coatings—high solids paints for autos in particular—and the emerging use of polyurethane binder adhesives in foundry cores and woodchip particleboard could well exceed the forecasted 720 million pounds for 1990.

Polyurethane products used in building and construction (including commercial refrigeration) will increase at a record pace during the '80s, from 390 million pounds to 1.1 billion pounds as shown in Figure 2. Demand for polyurethane foam residential sheathing will increase despite the current slowdown in residential housing starts. Demand will accelerate as housing starts return to normal levels.

Commercial roofing uses polyurethane rigid foam panels for the typical asphalt built-up roof construction. Polyurethane foam is ideal for asphalt-free, single-ply membrane roofing, using thicker layers (three inches or more) of insulation to maximize energy conservation. Residential sheathing may prove to be the fastest growing market, as consumers combat rising fuel and energy costs by using more efficient home insulation.

Fig. 1 Outlook of U.S. Polyurethane Demand.

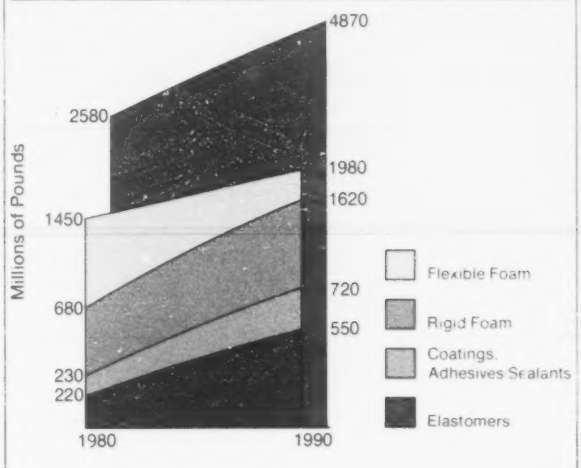
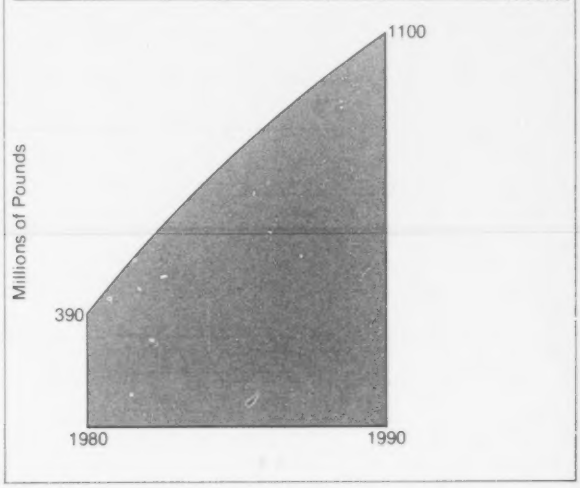


Fig. 2 Building/Construction Rigid Polyurethane Foam Demand.



Polyurethane rigid foam insulation may also be applied as a spray system on various surfaces. Retrofitting commercial roofs and insulating tanks and pipes have become popular. Emphasis on conserving energy in manufacturing facilities offers an ideal marketing opportunity for sprayed rigid foam insulation. By the end of this decade, demand for spray systems could double to 250 million pounds.

Transportation markets have always been major users of polyurethane products. Molded flexible foam cushioning provides superior seating and significantly reduces assembly labor costs. Although demand will fall as autos become smaller, it should recover to reach 430 million pounds in 1990 (Figure 3).

The auto industry, recognizing the need for improved fuel economy, has utilized lightweight polyurethane elastomers in flexible bumper fascia, trim and decorative body parts. Recently developed glass-filled polyurethane elastomers are being tested as possible auto fenders, doors and trunk lids.

The 90 million pounds projected for 1980 should nearly quadruple by the end of the decade. Widespread use of polyurethane elastomer external body components could add at least 100 million pounds to this total.

Of the many other end-use markets for polyurethane products, the three applications listed in Figure 4—footwear, carpet underlay and adhesive binders—appear most promising.

Polyurethane elastomer shoe soles are popular in women's fashion shoes and in sports footwear. Lightweight microcellular elastomer soles permit wide styling flexibility in women's shoes and can even simulate wood, cork, leather, and hand-stitching. Stylish sports shoes incorporate multi-color and multi-density soles. Current trends indicate this market could reach 75 million pounds by 1990.

Flexible polyurethane foam carpet underlay, using either prime or rebonded foam, offers superior cushioning and is particularly attractive for contract installations or premium carpets. The prime foam usage should reach 140 million pounds in 1980 and will probably increase at a rate of eight percent a year during this decade. Depending on scrap foam supply, demand for rebonded foam carpet underlay may approach 300 million pounds annually.

Polyurethane is well-recognized as a foundry adhesive or binder. As a binder for sand cores in metal casting, polyurethane is fast and energy-saving. Isocyanates are now used as binders for woodchip particleboard. Coated wood chips can be pressed into a particleboard or formed as a bonded woodchip core between thin wood veneers. Products containing isocyanate offer an excellent weather-resistant particleboard, as well as a manufacturing process that is formaldehyde-free and consumes less energy. These adhesive binder applications will total about 85 million pounds in 1980 and should increase rapidly to 350 million pounds over the next decade.

Canada

Canadian demand for polyurethane products parallels the U.S. growth pattern. Total demand in 1980 should reach 176 million pounds, slightly more than in 1979. Experiencing a decade of reasonable growth, in 1990, polyurethane demand could reach 350 million pounds.

End-use market potential also resembles U.S. trends. Transportation markets will use flexible foam cushioning and more polyurethane elastomers for bumper fascia and exterior auto body parts. Energy-saving insulation in extremely cold climates offers an excellent application for polyurethane rigid foam. And the well-established Canadian woodchip particleboard industry could become a significant user of isocyanate adhesive binder.

Fig. 3 Transportation Demand for Polyurethanes.

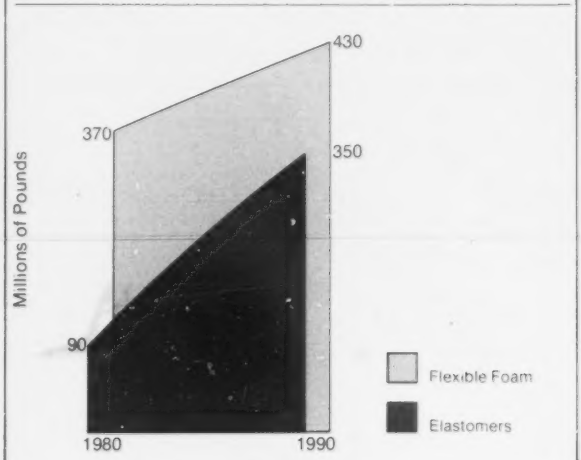
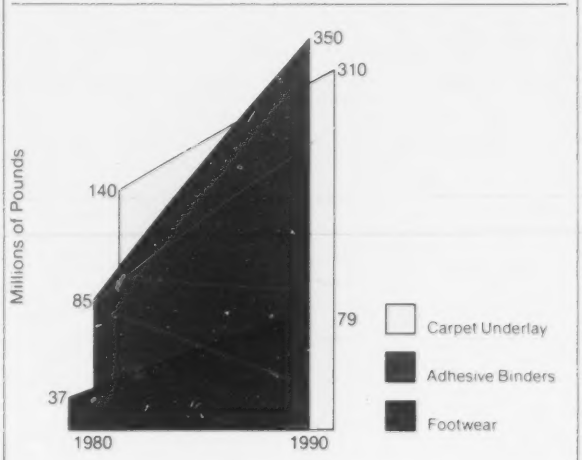
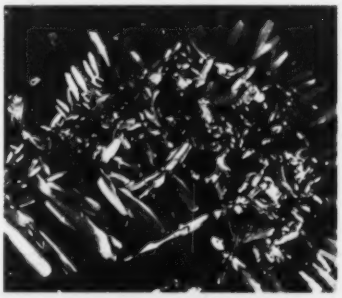


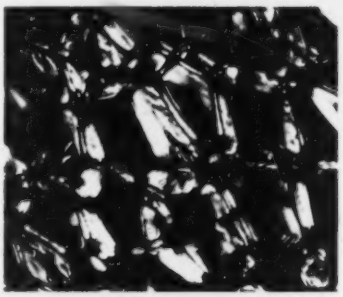
Fig. 4 Polyurethane Demand for Other Markets.



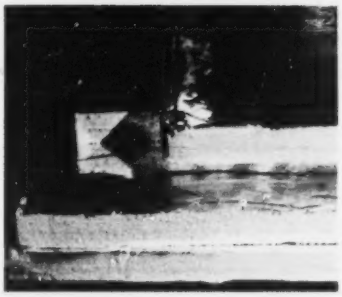
A crystal of pure MDI, the isocyanate cornerstone of the polyurethane industry, in a polarized light photomicrograph.



A crystal of polymeric MDI, the basis for the PAPI family of low-density polyurethane and isocyanurate foams as well as high density polyurethane foam for furniture and industrial parts, and for semiflexible foam used by the automotive industries.

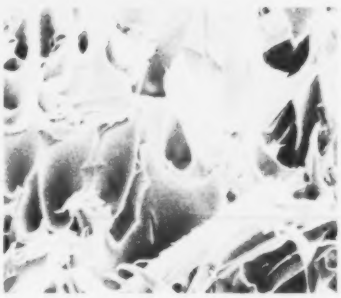


Low-density polymeric foam affords insulation and physical properties for a variety of construction and transportation applications.



Woodchips and Upjohn's polymeric isocyanurate binder combine to make particleboard. The binder will not stick to particle board molds, allowing faster, more efficient production of the construction material.

Scanning electron micrograph of a cross-section of RRIM automotive material made from Upjohn Isonate® pure MDI reinforced with glass fiber.



D. D. Threlkeld
Director, Administrative Services

The Changed & Changing Environment

Energy conservation catalyzed polyurethane growth in the '70s and will continue to be the major impetus for growth in the next decade.

Back in 1970, energy seemed cheap and abundant, and much of the industry's development effort aimed towards esthetic and recreational applications. For example, we anticipated growth in decorative polyurethane wood replacements for Mediterranean-style furniture.

Polyurethane elastomers were used for snowmobile treads and integral-skinned skis and for skateboard and rollerskate wheels. Introduced as a styling-oriented, conventional shoe sole material, polyurethane is now recognized for its superior wear and comfort.

Rigid polyurethane foam was well established as an insulant for commercial building by 1970, but residential use remained limited by building codes, resistance in the marketplace, and lack of modular building products.

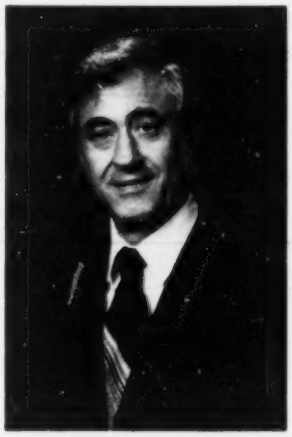
Regulatory constraints may actually boost polyurethane demand in the '80s. Federally mandated building insulation standards—for example, R-19 walls—would certainly increase the use of more rigid PUR foam chemicals. With polyurethane's superior insulating properties, stringent standards will tend to favor polyurethane over competing insulation materials. In the automotive area, federally mandated standards for fuel economy and impact damage will encourage the use of polyurethane elastomers.

Workplace safety is a vital concern of the chemical industry, but ineffectual government regulation merely adds to costs. It appears that the new Toxic Substances Control Act will jeopardize the development of many new chemicals, because of the prohibitive cost of premarket testing. This may deprive the polyurethane industry of new chemicals which could lead to new applications. Our legislators and bureaucrats continue to try to enforce a no-risk environment at great cost to industry and consumers alike.

Yet the public is recognizing that government controls and litigation inhibit growth and innovation and contribute to inflation. Small businesses are often hit hardest. R&D spending among chemical intermediate manufacturers continues to increase, but is limited by sales dollars allocated for energy costs, inflation, high interest rates, and the cost of regulatory compliance. Free enterprise and cost/benefit principles must prevail between government and business if these problems are to be solved by 1990.

Although the future has never been more uncertain, isocyanates and polyurethane products are expected to meet the challenge of change in the eighties as they did in the seventies.

Joseph A. Pagliuca
Assistant to the
Group Sales Manager



Polyurethane Insulation

Efficient insulation materials are of growing importance in both commercial and residential construction, boosting the use of plastic foam—particularly rigid polyurethane. Demand for continuous laminate panels has expanded rapidly during the past five years and will continue to grow.

Laminate producers are well aware of polyurethane foam's advantages as a sheathing and roof insulation material and are consistently developing new technology and better quality control to fully utilize the physical and chemical properties of rigid polyurethane foam.

A polyisocyanurate or polyurethane foam core is produced by continuously laminating foam to various facings, on a conveyor that controls the thickness of the panel. The foam cores are integrally bonded to facings including asphalt-saturated organic and inorganic felt, aluminum foil, and poly kraft paper.

Bonding the foam core to the facers creates a strong, tough insulation panel with excellent dimensional stability for better installation. In commercial and industrial roof insulation, boards are available with substrates of perlite, glass fiber, or gypsum board, and top facings of asphalt-saturated felt or glass-fiber mat. Composite boards act as thermal barriers; the upper faces serve as vapor barriers. And the advent of a noncomposite roof insulation board, combining glass fibers and an isocyanurate foam core within facings of asphalt-saturated asbestos, promises superior dimensional stability.

Insulation values are changing drastically, and demand for premium insulation will increase as utility costs rise. R-value standards are continually changing and vary from R-12 to R-20, depending on geographic location. Many states require an R-20 minimum in roof construction; builders are erecting homes using R-19 or better insulation on exterior walls. Although new construction in 1980 may be temporarily down, the retrofit market has tremendous potential, at least equalling new nonresidential construction on a square foot basis. Integral wall panels composed of polyurethane gypsum composites are making inroads—upgrading walls, in retrofit and in new construction. Now contractors are able to produce wall insulation and interior finish simultaneously. Using integral panels in new construction eliminates two steps and cuts installation time in half.

Foamed plastics comprise 21 percent of the market and are expected to reach nearly a 50 percent market share by 1985.

Roof systems have traditionally been waterproofed with the conventional technique widely referred to as

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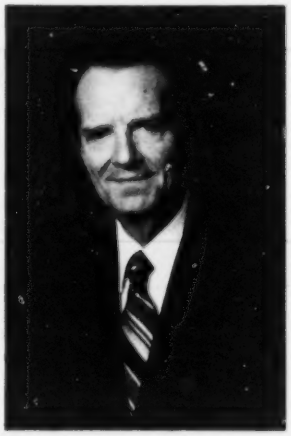

Charles E. McLouth
Sales Manager, North
American Sales

Competitive Plastic Materials, Also on the Move

The decade ahead promises to be an exciting period for the plastics industry. New compounds and technologies will replace the old familiar ones... new process innovations will give birth to new end products opening up new horizons for growth. Current developments represent only the tip of the iceberg. Some of these developments may result in more new substitutes for metals where polyurethane processes like RIM have made big inroads, and other materials will continue to gain in usage. Epoxy plastics, like polyurethane thermoplastics, will increase usage in automotive and nonautomotive applications. Phenolic insulation foams and new manufacturing processes for expanded polystyrene materials will provide new entries in laminate markets. The polyurethane industry must monitor these competitive materials and their future applications so that polyurethane can continue to pace the burgeoning plastics industry.

For instance, consider the recent process innovation that produces a hard skin on expanded styrene foam, opening up a new field for EPS in furniture, insulation foams, automotive applications, and advertising materials. New foil bonding techniques will make EPS insulation board easier to handle and more effective. Phenolic insulation (R-value of 4.5 to 5.5) foams, which are fabricated into board stock, promises a low burn rate and low smoke generation equivalent to isocyanurate foams. However, the foam and application techniques must be improved to eliminate the corrosive effects and to improve fragility. The use of high molecular-weight copolymer of polyethylene will increase rigidity and low-temperature crack resistance in this material, opening new vistas for automotive and structural foam applications.

New developments have emerged that vastly improve the properties of sheet molding compound and its processing. Thick molding compound (TMC) has made SMC stronger and more economical. New faster reacting versions of SMC will cut the thickening time and provide more toughness and impact-resistance. This will increase its usefulness in automotive applications such as structural members, door panels, front ends, and bumper assemblies along with polyurethane. Sheet molding urethane compound (SMUC) has better physical properties than SMC and reportedly is more economical than polyurethane RIM materials. New in-mold polyurethane coating processes may make a Class A finish on SMC possible. Class A finishes open up applications for auto body parts including fenders, door panels, front and rear ends.

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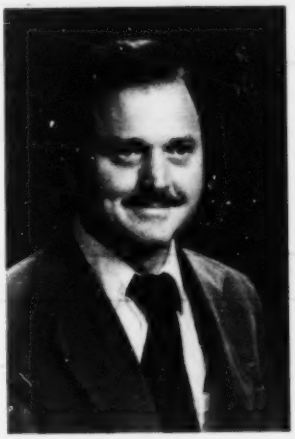
T. Roy McClellan
Manager, Customer Technical Services



Polyurethane Elastomers

As processes and chemical know-how continue to broaden the scope of polyurethane elastomer applications, it is evident that the potential for these unique and versatile rubbers and elastoplastics has barely been tapped. U.S. production is between 75 and 80 million pounds of high-performance elastomers. The industry anticipates a quantum jump in this decade.

Federal pressure for improved auto mileage will continue to mandate lighter vehicles. RIM-molded elastomers should continue to enjoy strong growth in "soft front ends," and the early eighties will see the first RRIM (reinforced RIM) structural exterior automotive fenders, trunks, and doors.

Polyurethane elastomer parts produced via thermoplastic processes since their inception in the early sixties have been gradually accepted by plastics fabricators. Today, the market consumes 30 million pounds of these polymers with growth commensurate with their role as "engineering" rubbers.

Polyurethane spandex fibers should continue their steady growth through the eighties. Fashion trends demanding lighter weight, leisure and sports apparel should increase the need for the highly elastic and supportive qualities of spandex fiber in these fabrics.

Cast microcellular polyurethane elastomers, like their solid counterparts, exhibited excellent abrasion resistance and moldability and emerged during the late sixties as an ideal fashion shoe material. This application began in Italy and spread throughout the world. Current PU soling production in the U.S. runs about 20-25 million pounds per year.

In the eighties, polyurethane microcellular elastomers are apt to follow a more even growth curve. Spin-off technology from the RIM automotive area should add impetus to growth in high-density, durable men's soles and sport boots.

The castable elastomer market, currently utilizing 30 to 40 million pounds per year, is based on more than two decades of steady progress. The recognized advantages of cast polyurethane rubbers, where liquids could be poured into low-cost tooling and converted *in situ* to tough, thermoset elastomers exhibiting extraordinary abrasion resistance in a diversified aqueous/oil/dry particulate or mechanical wearing applications, should greatly intensify growth during the next decade. Future utilization of the RIM process for these applications will enable higher production rates and further allow penetration of the traditional energy intensive rubber markets.

Victor V. D'Ancicco
Product Business Manager

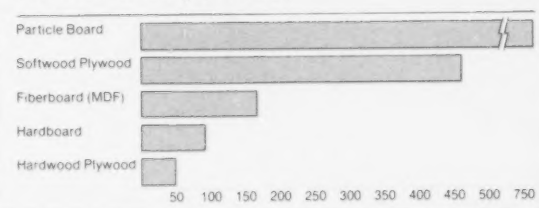
Isocyanate Binder Technology

Isocyanates have been used to manufacture adhesives and binders for years. Of the 1979 total polyurethane demand for adhesives and sealants (108 million pounds), 60 million pounds were consumed as a sand binder for foundry core production. Usage will drop in 1980, due to reduced automotive production and smaller castings—but demand in the '80s should increase approximately seven to eight percent per year. Rising energy costs will spur the growth of "no bake" sand binders produced with isocyanates.

The construction industry used only 10 million pounds of isocyanates and polyurethanes as binders/adhesives last year. Urea-formaldehyde (UF) and phenol-formaldehyde (PF) are traditionally used as binders and adhesives in the production of plywood, particleboard, hardboard, and medium-density fiberboard (MDF). It is estimated that in 1978 more than 19.7 billion square feet (¾" basis) of softwood plywood was produced, consuming over 450 million pounds of phenolformaldehyde. By 1985, the total plywood demand will be greater than 22 billion square feet.

Although adhesive consumption for plywood was at record levels for 1979, the trend will change as rising interest rates and tight mortgage money cause a downturn in the construction of single family dwellings, possibly into 1981.

1978 Binder Adhesive Usage in the Wood Industry (MM lbs.)



And suitable logs for plywood production are becoming more expensive and scarce. According to The American Plywood Association, the price of forest timber has increased more than four times since 1970, while the cost of plywood has increased about 2.5 times—promoting the full utilization of the biomass via production of particleboard, composite board...and, more recently, flake board. In plywood production, approximately 45 percent of a log is converted to veneer, whereas particleboard or composite board production uses virtually all of the log; almost the entire tree, including limbs, bark, and roots, can be used.

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Polyurethane Insulation Continued

BUR (built-up roofing). Now alternative systems, such as the single-ply roof membrane, are seen as the future of the industry to offset rising asphalt prices and labor costs.

The single-ply roof membrane is one new, popular alternative. There are two types of single-ply systems: loose-laid membrane topped with ballast and smooth-roof membrane without ballast. The smooth-roof membrane is fastened to the deck surface with adhesive; the loose membrane system is chemically or thermally fused to the membrane surfaces being joined (not attached to the roof substrate).

With polyurethane's proven record as a thermally efficient insulation—plus new technology and improved application methods—the market for this important product will continue to thrive.

Competitive Plastics Continued

New filled (30 percent to 45 percent) thermoplastic polyesters are now available which eliminate previous warpage problems. Further refinements will qualify them for use in exterior automotive body components.

Constant innovation and achievement are necessary to survive in today's plastics industry. At Upjohn we believe that with new polyurethane compounds, improved processing technology, and new combinations of polyurethane sandwich materials, our polyurethane products will more than hold their own in the marketplace of the '80s.

Isocyanate Binder Technology Continued

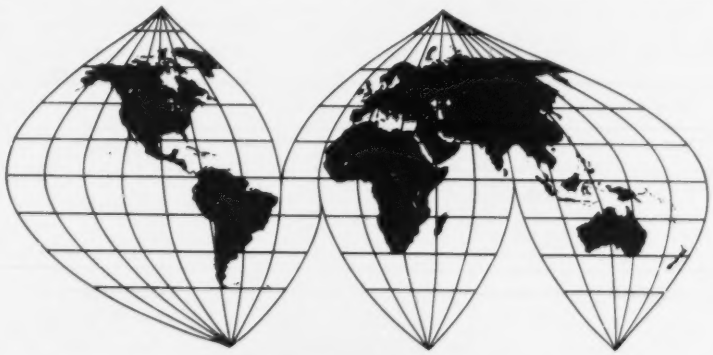
Most of the particleboard production in the U.S. has used urea-formaldehyde as the binder resin and was confined to interior use, with half of the production going for furniture, 20 to 25 percent for floor underlayment, 10 to 15 percent for mobile home construction and 5 to 10 percent for miscellaneous products.

The shortage of construction plywood in the early 1970s encouraged the use of structural particleboard and exterior binders. (Up to 1979, this type of board amounted to only about five percent of the particleboard produced, possibly due to the problems of using phenol-formaldehyde binder.)

In the 1980s, increasing wood shortages and costs will speed the development of structural particleboard, oriented strand board and composite products. The American Plywood Association has recently approved a new definition of "structural-use panel products." Qualified panels of composite construction, veneered or unveneered, used for certain applications will now be eligible for the full range of APA services.

Demand for wood products will explode in the '80s, as over 40 million Americans reach prime home-buying age of 30. Newer types of composite board, particleboard, wafer board, and oriented strand board will experience tremendous growth—perhaps exceeding 4.5 billion square feet per year.

To meet the growing need for faster-curing, more efficient binder resins, Upjohn recently introduced ISOBIND™—enabling the total biomass, including hardwoods, to be used in an exterior environment with no release of formaldehyde fumes.



Upjohn Polymer Chemicals
P.O. Box 685
LaPorte, TX 77571
Telephone: 713-479-1541
Telex: 79-0013

Upjohn
POLYMER CHEMICALS

Upjohn Polymer (Europa) AG
P.O. Box 91, Poststrasse 28
CH 9001 St. Gallen Switzerland
Telephone: 071-209161
Telex: 719281 UPAG-CH

CPR Division; The Upjohn Company
555 Alaska Avenue
Torrance, California 90503
Telephone: 213-320-3550
Telex: 910-349-6655

Upjohn Polymer (Europa) AG
Piccadilly House, 35 Regent St.
London SW1 Y4NE, England
Telephone: 01-4398961
Telex: 269740

Admiral Maschinenfabrik GmbH
Lehmgrubenweg 17
D-8990 Lindau, West Germany
Telephone: 08382-4014
Telex: 54305

The Admiral Company of Japan, Ltd.
Matsumoto Building, Fourth Floor
10-5 1-Chome, Kyobashi
Chuo-Ku, Tokyo, Japan
Telephone: 03-563-3871
Telex: 781-24901

Polymer Chemicals Division of Upjohn, S.p.A.
Via Vittoria Colonna 12
1-20149 Milan, Italy
Telephone: 02-4986051
Telex: 331 528

ISOPOR
Companhia Portuguesa de Isocianatos, LDA
Apartado 30
3861 Estarreja Codex, Portugal
Telephone: 351-34-43233
Telex: 24492 ISOPOR P

Poliolchimica S.p.A.
(This is a joint venture)
Parona (PV), Italy

Admiral Espanola S.A.
c/o San José
S.N. local II
E-Viladecans (Barcelona), Spain
Telephone: 03-6584211
Telex: 52920

Kasei Upjohn Company
Shin-Kokusai Building
4-1 Marunouchi 3-Chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-213-1210
Telex: 781-24901

Upjohn Polymer S.A.R.L.
95, Bd. Berthier
75017 Paris, France
Telephone: 01-7558469
Telex: 640364

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Profitability has been improving for the chemical industry generally. But, as a glance at the figures on this and the following four pages indicates, there are wide variations within the industry. Much depends on what types of chemical products a company makes and what markets it serves in determining whether its profit margins and return on stockholders' equity will be above or below average.

By and large, companies that focus on specialty products tend to reap the largest profits relative to sales or net worth. Hence, no other major chemical producer earns more, per dollar of sales, than International Flavor & Fragrances, although Lubrizol and Nalco Chemical top it in return on equity (and also enjoy well-above-average margins themselves).

Even better positioned to turn a profit are some of the major pharmaceutical companies, especially ethical drug firms with widely used products that have strong patent protection. A prime example is SmithKline, with its hot-selling Tagamet drug for gastrointestinal disorders; sales of Tagamet and related products accounted for a third of SmithKline's total.

On the other end of the profitability spectrum are likely to be found companies making commodity-type products and selling into highly competitive, price-sensitive markets. Cases in point: fertilizer producers such as Williams, Terra Chemicals, and First Mississippi whose profits have been crimped during the past couple of years by price competition and soaring costs for feedstocks, especially natural gas.

Explanation of table headings

Year. Data are for calendar year unless otherwise indicated.

Net sales. Gross sales, less discounts, allowances, and returns; generally excludes excise taxes and other operating income or revenues.

Net income. Net sales and other income, less operating costs, nonoperating charges, depreciation, depletion, interest expense, deferred charges, minority interest in income, and taxes. Nonrecurring or extraordinary credits and charges have been excluded in most cases, but these items are indicated by a footnote.

Total assets. Sum at year's end of current assets, investments, prepaid expenses, net plant and equipment, and other tangible assets. Excludes insofar as possible intangible assets including goodwill, value of patents and trademarks, and the like.

Current ratio. The ratio of current assets (cash, marketable securities, receivables, and inventories but excluding prepaid expenses) to total current liabilities.

Net plant and equipment. Value at year's end of fixed assets, less accumulated depreciation, amortization, and depletion.

Capital expenditures. Total spending during the year for new fixed assets, such as plant, equipment, and land, and for replacement and modernization of facilities.

Net worth. Equity at year's end of preferred and common stock holders, including value of capital stock, capital and earned surplus, and surplus reserves, as well as contingency and miscellaneous reserves for which no definite purpose is stated. Intangible assets are deducted insofar as possible.

Net income (breakdown). **Per cent of sales:** net income divided by net sales. **Per cent of net worth:** net income divided by tangible net worth. **Dollars per share:** net income, less preferred dividends, divided by the number of shares of common stock outstanding. All figures are adjusted for stock splits but no adjustment has been made for earlier years as a result of stock dividends nor for dilution that might result from the conversion of preferred stock or debt to common stock or the exercise of stock options outstanding.

Dividends per share. Cash dividends paid (or declared) on each share of common stock; excludes the value of stock dividends, which are indicated by a footnote.

Dividend yield. Dividends per share divided by the average of the high and low prices of the common stock during the calendar year.

Stock price range. High-low market prices of common stock during the calendar year, adjusted for stock splits but not for stock dividends.

Price-earnings ratio. Average of the high and low prices of the common stock during the calendar year divided by net income per share of common stock.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
Money figures in thousands of dollars unless otherwise indicated														
CHEMICALS														
Air Products & Chemicals														
1979[a]	$1,229,894	$97,540	$1,415,024	1.3	$945,013	$246,050	$563,702	7.9%	17.3%	$3.45	$0.65	2.1%	$37 1/4–23 3/4	8.8
1978[a]	1,039,052	76,184	1,180,754	1.2	801,809	199,847	477,557	7.3	16.0	2.70	0.50	1.8	31 7/8–22 1/2	10.1
1977[a]	947,239	67,707	1,022,540	1.5	691,904	142,616	416,190	7.1	16.3	2.40	0.25[b]	0.9	35 7/8–21	11.8
1976[a]	818,213	63,479	891,881	1.4	934,253	160,433	353,396	7.8	18.0	2.30	0.125[b]	0.4	41 1/2–29 5/8	15.5
Akzona														
1979	$1,012,398	$25,647	$818,125	2.2	$402,178	$54,486	$323,875	2.5%	7.9%	$2.10	$0.80	5.6%	$17 1/8–11 1/4	6.8
1978	868,711	20,832	704,095	2.5	374,065	42,404	307,790	2.4	6.8	1.69	0.80	6.0	15 1/4–11 1/4	7.8
1977	808,847	7,523	674,937	2.6	374,315	35,191	300,287	0.9	2.5	0.60	1.10	7.2	19 1/8–11 1/4	25.3
1976	728,571	5,622	675,134	2.6	382,085	38,126	306,594	0.8	1.8	0.45	1.20	6.1	25 3/4–13 3/8	43.5
Allied Chemical Corp.														
1979	$4,332,391	$201,080[c]	$4,159,798	1.1	$2,168,816	$408,668	$1,377,701	4.6%	14.6%	$6.84[c]	$2.00	5.1%	$49 1/2–28 1/2	5.7
1978	3,267,956	124,557[d]	3,182,335	1.4	2,041,409	502,040	1,226,710	3.8	10.2	4.40	2.00	5.5	44 3/4–27 5/8	8.2
1977	2,922,751	138,378[e]	2,825,965	1.7	1,809,369	464,638	1,151,112	4.7	12.0	4.93[e]	1.85	4.1	51 3/8–38 3/4	9.1
1976	2,629,567	126,305[f]	2,382,823	2.0	1,454,105	346,776	1,057,784	4.8	11.9	4.52[f]	1.80	4.6	44 7/8–33 3/8	8.7
American Cyanamid Co.														
1979	$3,186,998	$168,495	$2,810,725	1.6	$1,303,308	$235,416	$1,331,130	5.3%	12.7%	$3.52	$1.60	5.3%	$36 1/8–23 3/4	8.5
1978	2,780,170	155,943	2,510,038	1.8	1,212,807	251,034	1,238,396	5.6	12.6	3.26	1.50	5.4	32 1/8–22 5/8	8.5
1977	2,412,311	139,400	2,205,363	2.0	1,081,908	235,451	1,152,003	5.8	12.1	2.92	1.50	5.7	29 3/4–23	9.0
1976	2,093,815	135,766	1,985,125	2.3	916,708	231,844	1,091,871	6.5	12.4	2.84	1.50	5.8	28 1/8–23 1/2	9.1

a Fiscal year ends Sept. 30. b Plus 2% stock dividend. c From continuing operations; excludes net losses from discontinued businesses of $164.8 million ($5.75 per share) and nonrecurring net losses of $25.4 million ($0.89 per share). d Excludes nonrecurring net loss from sales of plants of $4.3 million ($0.15 per share). e Excludes extraordinary charge representing costs related to Kepone problem of $3.1 million ($0.11 per share), but includes net gains on disposition of operating assets and real estate, less provision for write-off of notes held or guaranteed, of $16.0 million. f Excludes extraordinary net charge representing costs related to Kepone problem of $9.5 million ($0.34 per share), but includes gains on disposition of operating assets and real estate, less loss on termination of gas supply contract, of $18 million.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
	Money figures in thousands of dollars unless otherwise indicated													
Big Three Industries														
1979	$509,449	$62,859	$700,052	2.3	$488,921	$ 79,710	$404,137	12.3%	15.6%	$3.13	$0.84	2.2%	$44½–31⅝	12.2
1978	428,934	56,718	604,437	2.2	449,707	93,374	357,478	13.2	15.9	2.83	0.68	2.0	40½–29	12.3
1977	341,171	49,227	515,830	2.3	391,086	124,494	313,845	14.4	15.7	2.46	0.40[a]	1.3	35½–27⅜	12.8
1976	274,508	36,612	439,591	3.0	288,154	107,056	268,385	13.3	13.6	1.91	0.33	1.0	40½–27⅞	17.9
Cabot Corp.														
1979[b]	$1,122,391	$70,445	$918,431	2.0	$401,638	$ 96,442	$358,031	6.3%	19.7%	$6.83	$1.40	3.5%	$50 –30½	5.9
1978[b]	713,136	46,580	752,089	2.5	353,020	111,902	303,542	6.5	15.3	4.59	1.05	3.5	38½–21⅛	6.5
1977[b]	574,836	39,901	575,322	2.6	273,104	50,258	280,932	6.9	14.2	3.79	0.75	3.5	24⅝–18½	5.7
1976[b]	460,997	29,373	515,462	2.6	259,707	44,270	263,731	6.4	11.1	2.75	0.50	3.2	21⅜–9⅜	5.6
Celanese Corp.														
1979	$3,146,000	$141,000	$2,374,000	1.8	$1,150,000	$245,000	$1,033,000	4.5%	13.6%	$9.52	$3.10	7.0%	$48¾–39⅜	4.6
1978	2,609,000	112,000[c]	2,148,000	2.0	1,148,000	248,000	936,000	4.3	12.0	7.61[c]	2.85	6.6	47⅛–35⅝	5.4
1977	2,320,000	70,000	1,998,000	2.0	1,119,000	243,000	816,000	3.0	8.6	4.70	2.80	6.0	53 –40	9.9
1976	2,123,000	69,000	1,897,000	1.8	1,071,000	223,000	783,000	3.3	8.8	4.67	2.80	5.6	58 –41¾	10.7
Crompton & Knowles Corp.														
1979	$239,638	$7,075	$131,433	2.2	$28,822	$7,895	$55,212	3.0%	12.8%	$3.05	$1.04	6.6%	$18⅜–13	5.1
1978	217,412	6,137	127,177	2.3	25,110	4,484	49,699	2.8	12.3	2.65	0.96	6.1	19 –12⅝	6.0
1977	192,729	5,408	107,175	2.7	24,105	2,976	45,938	2.8	11.8	2.35	0.90	6.0	17¼–12¾	6.4
1976	154,377	4,709	93,908	2.8	17,211	2,042	46,077	3.1	10.2	2.03	0.80	6.1	15¾–10½	6.5
Diamond Shamrock Corp.														
1979	$2,393,935	$178,123	$2,329,892	1.9	$1,382,931	$256,564	$931,267	7.6%	19.1%	$3.37	$1.51	6.0%	$31½–19	7.5
1978	1,677,602	131,063	1,959,509	1.9	1,294,970	286,843	790,555	7.8	16.6	3.26	1.42	5.8	29¾–19	7.5
1977	1,530,382	162,123	1,718,768	2.0	1,140,765	367,512	701,179	10.6	23.1	4.28	1.175	3.6	38⅝–26⅜	7.6
1976	1,356,552	140,030	1,389,506	1.9	912,071	285,457	580,146	10.3	24.1	3.90	0.95	2.9	40 –26½	8.5
Dow Chemical Co.														
1979	$9,255,387	$783,898[d]	$10,144,745	1.4	$5,236,404	$1,267,719	$3,789,746	8.5%	20.7%	$4.33[d]	$1.45	4.9%	$34⅞–24⅜	6.8
1978	6,887,623	575,224	8,705,081	1.6	4,762,129	1,075,173	3,310,655	8.4	17.4	3.16	1.25	4.7	30⅞–22	8.4
1977	6,234,255	555,703	7,591,752	1.5	4,199,539	1,163,016	3,033,636	8.9	18.3	3.01	1.10	3.2	43¾–25¼	11.5
1976	5,652,070	612,767	6,765,075	1.4	3,553,920	1,186,193	2,781,421	10.8	22.0	3.30	0.90	1.9	57¼–38⅜	14.5
E. I. du Pont de Nemours & Co.														
1979	$12,571,800	$938,900	$8,918,700	2.5	$3,942,400	$464,000	$5,290,600	7.5%	17.7%	$6.42	$2.75	6.5%	$48¼–37	6.6
1978	10,584,200	787,000	8,047,700	2.3	3,839,000	714,200	4,737,800	7.4	16.6	5.39	2.42	6.1	46⅛–32½	7.3
1977	9,434,800	545,100	7,379,500	2.5	3,886,200	703,600	4,265,900	5.8	12.5	3.69	1.92	4.8	45 –35⅛	10.9
1976	8,361,000	459,300	6,965,800	2.4	3,844,700	876,200	3,977,900	5.5	11.5	3.10	1.75	3.8	53¾–39⅛	15.0
Ethyl Corp.														
1979	$1,656,977	$97,515	$1,070,968	2.8	$512,981	$122,878	$536,671	5.9%	18.2%	$4.94	$1.35	5.3%	$30 –21	5.2
1978	1,422,451	82,698	1,001,584	2.9	446,346	95,803	514,693	5.8	16.1	4.24	1.10	5.1	24⅞–18½	5.1
1977	1,282,087	78,024	911,072	3.5	402,335	87,649	463,070	6.1	16.8	4.29	0.875	4.2	22⅞–18⅜	4.8
1976	1,154,210	69,080[e]	857,217	3.4	365,166	87,656	411,161	6.0	16.8	3.59[e]	0.75	3.8	24⅝–14¾	5.5
Ferro Corp.														
1979	$591,930	$30,912	$387,703	1.8	$115,831	$33,132	$200,625	5.2%	15.4%	$4.07	$1.14	4.7%	$29⅜–19	5.9
1978	494,414	27,657	310,612	2.0	86,805	19,385	175,618	5.6	15.7	3.67	1.05	4.0	35 –17⅛	7.1
1977	420,042	20,903	254,254	2.4	71,902	19,693	157,975	5.0	13.2	2.78	0.90	4.5	22⅝–17⅝	7.2
1976	376,485	20,054	246,301	2.1	68,150	10,442	143,960	5.3	13.9	2.68	0.78	3.9	24 –14½	7.2
First Mississippi Corp.														
1979[f]	$178,400	$ 4,661	$200,370	2.8	$63,942	$17,046	$95,073	2.6%	4.9%	$0.55	$0.40	2.0%	$29⅜–10	35.8
1978[f]	155,525	4,170	205,837	2.9	72,190	12,558	93,528	2.7	4.5	0.49	0.39	3.2	16½–8	25.0
1977[f]	161,448	14,435[g]	210,679	2.8	76,476	25,112	91,986	8.9	15.7	1.72[g]	0.36	2.8	17 –8⅝	7.4
1976[f]	148,174	12,909	169,164	2.6	64,243	25,887	79,819	8.7	16.2	1.52	0.36	3.0	15⅛–8½	7.8
W. R. Grace & Co.														
1979	$5,266,629	$222,580[h]	$3,680,847	1.6	$1,629,361	$477,688	$1,524,276	4.2%	14.6%	$5.02[h]	$1.975	5.9%	$41¼–25⅜	6.7
1978	4,309,588	170,403[i]	3,201,126	1.9	1,317,159	275,308	1,333,772	4.0	12.8	4.23[i]	1.85	6.6	32⅜–23¾	6.6
1977	3,976,233	140,475[c]	2,870,719	1.8	1,216,950	263,633	1,156,899	3.5	12.1	3.71[i]	1.775	6.2	31⅝–25⅞	7.7
1976	3,615,153	131,882[h]	2,681,401	1.9	1,050,335	212,096	1,080,881	3.6	12.2	3.55[h]	1.70	5.8	33⅞–24¼	8.2
Hercules														
1979	$2,345,425	$144,500[j]	$1,761,177	1.9	$772,889	$185,998	$945,422	6.2%	15.3%	$3.27[j]	$1.075	5.5%	$22¾–16⅛	5.9
1978	1,946,477	103,264[m]	1,590,306	1.9	714,286	115,807	812,159	5.3	12.7	2.36[m]	1.00	6.5	18⅝–12¼	6.5
1977	1,697,787	57,930[n]	1,469,276	2.2	721,292	127,484	749,303	3.4	7.7	1.36[n]	1.00	4.6	28½–14¾	15.9
1976	1,595,956	76,900[e]	1,423,124	2.2	699,383	150,294	734,862	4.8	10.5	1.78[e]	0.85	2.7	38 –24	17.4

a Plus 2% stock dividend. b Fiscal year ends Sept. 30. c Excludes cumulative effects of change in accounting for investment tax credits of $43 million ($3.01 per share). d Includes gain on sale of oil and gas properties, before taxes, of $84.8 million. e Includes loss on disposal of Oxford Paper division of $1.5 million. f Fiscal year ends June 30. g Includes gains on sale of oil and gas leases, from cancellation of raw material purchase contract, and on settlement of litigation of $5.1 million. h Includes net gains on disposal of businesses of $12.8 million. i Includes net gains on disposal of businesses of $8.0 million. j Includes net losses on disposal of businesses of $17.2 million. k Includes net gains on disposal of businesses of $810,000. l Excludes net gain on sale of pigments and methanol assets of $28.0 million ($0.62 per share). m Includes net loss from write-down of facilities of $4.9 million ($0.11 per share). n Includes net loss from write-down of facilities of $6.2 million ($0.26 per share). o Excludes nonrecurring net gain on sale of property, plant, and equipment of $29.9 million ($0.66 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
Money figures in thousands of dollars unless otherwise indicated														
International Flavors & Fragrances														
1979	$409,299	$61,472	$387,807	3.6	$114,255	$15,180	$285,425	15.0%	21.5%	$1.68	$0.74	3.4%	$25⅝–18¼	13.1
1978	365,881	56,199	345,073	3.4	109,092	20,014	252,706	15.4	22.2	1.53	0.59	2.5	27⅝–19⅝	15.4
1977	314,307	45,705	306,045	3.2	98,567	16,640	219,230	14.5	20.8	1.25	0.46	2.2	23⅝–18¼	16.8
1976	274,210	37,609	277,312	2.7	89,953	10,635	191,484	13.7	19.6	1.03	0.33	1.4	28⅜–19	23.0
International Minerals & Chemical Corp.														
1979	$1,474,700	$120,800	$1,537,600	1.7	$936,600	$173,500	$790,200	8.2%	15.3%	$6.72	$2.80	5.8%	$61½–35¼	7.2
1978[a]	1,364,400	120,100	1,461,900	1.9	879,400	193,600	721,000	8.8	16.7	6.61	2.60	6.7	43½–34	5.9
1977[a]	1,280,200	108,200	1,368,600	2.0	778,600	174,800	649,300	8.5	16.7	6.09	2.45	6.2	44⅛–35¼	6.5
1976[a]	1,260,000	135,400	1,248,900	2.1	666,000	154,900	580,700	10.7	23.3	7.75	2.10	5.6	42¼–32¾	4.8
Liquid Air Corp. of North America														
1979	$369,109	$24,698	$399,354	1.7	$259,006	$50,714	$191,641	6.7%	12.9%	$2.49	$1.40	5.3%	$28¾–23¾	10.5
1978	304,266	18,346	299,419	1.8	180,327	37,092	121,097	6.0	15.1	2.48	1.40	5.2	30½–23½	10.9
1977	284,495	19,896	275,004	1.8	160,321	31,914	113,751	7.0	17.5	2.75	1.40	5.0	32¾–23½	10.2
1976	265,561	21,343	243,251	1.7	142,595	21,664	110,208	8.0	19.4	2.75	1.25	4.2	35 –24	10.7
Lubrizol Corp.														
1979	$724,734	$90,775	$519,942	2.5	$180,405	$50,807	$374,751	12.5%	24.2%	$4.66	$1.60	3.2%	$59⅞–41	10.8
1978	586,477	77,365	441,735	2.8	150,018	44,373	323,036	13.2	23.9	3.95	1.405	3.4	48¼–33⅜	10.3
1977	507,121	58,069	360,467	3.2	121,369	22,982	271,783	11.5	21.4	2.96	1.25	3.8	37⅜–27¾	11.0
1976	450,854	50,957	344,005	3.4	113,455	19,420	261,633	11.3	19.5	2.52	1.05	2.8	44⅞–31⅛	15.1
Mallinckrodt Inc.														
1979	$392,470	$31,932[b]	$317,798	3.4	$130,416	$19,640	$213,617	8.1%	14.9%	$3.40[b]	$1.05	3.5%	$33¼–26½	8.8
1978	365,722	28,841	271,030	3.8	125,585	17,062	180,778	7.9	16.0	3.07	0.90	2.7	41¾–26	11.0
1977	313,204	27,163	243,051	4.1	113,015	25,195	158,387	8.7	17.1	2.89	0.75	2.1	40¼–29¾	12.1
1976	277,687	24,183	212,424	3.8	93,856	26,675	137,630	8.7	17.6	2.62	0.55	1.3	49¾–36½	16.5
Monsanto Co.														
1979	$6,192,600	$331,000[a]	$5,539,100	2.2	$2,817,800	$565,900	$2,781,800	5.3%	11.9%	$9.11[c]	$3.35	6.3%	$ 62 –45	5.9
1978	5,018,700	302,600[d]	5,035,700	2.5	2,604,800	479,900	2,579,400	6.0	11.7	8.29[d]	3.175	6.1	60¼–44⅛	6.3
1977	4,594,500	275,600	4,350,100	2.6	2,408,700	607,100	2,400,900	5.9	11.5	7.46	3.025	4.3	88⅞–52	9.4
1976	4,270,200	366,300	3,959,100	2.9	2,089,800	646,800	2,252,500	8.6	16.3	10.05	2.75	3.1	100 –76	8.8
Nalco Chemical Co.														
1979	$578,908	$63,277	$368,074	2.5	$126,774	$39,018	$261,966	10.9%	24.2%	$3.18	$1.36	4.4%	$35⅝–26¼	9.7
1978	476,208	53,652[e]	309,666	2.5	105,197	34,278	221,814	11.3	24.2	2.71[e]	1.24	4.3	32¾–24⅜	10.5
1977	445,602	50,113	285,005	2.5	99,890	35,324	208,286	11.2	24.1	2.51	1.065	3.6	34⅝–24¾	11.8
1976	385,581	43,564	258,431	2.5	81,849	16,302	183,251	11.3	23.8	2.17	0.82	2.5	36½–29½	15.9
Olin Corp.														
1979	$1,778,102	$71,150	$1,461,073	1.7	$764,108	$161,151	$739,992	4.0%	9.6%	$2.97	$0.97	4.7%	$25 –16⅛	8.9
1978	1,560,075	62,769	1,393,064	1.7	742,158	162,519	691,563	4.0	9.1	2.62	0.88	4.5	25¾–13⅜	7.5
1977	1,472,500	78,116	1,276,097	2.0	666,580	208,140	553,066	5.3	12.0	3.24	0.815	4.2	22⅛–16⅝	6.0
1976	1,376,523	72,563	1,067,595	2.0	525,781	165,691	594,387	5.3	12.2	3.03	0.68	3.6	22½–15⅛	6.2
Pennwalt Corp.														
1979	$1,079,303	$49,997	$775,355	2.1	$298,420	$67,486	$346,140	4.6%	14.4%	$5.01	$2.20	6.1%	$35⅞–30½	6.6
1978	921,369	44,973	672,343	2.1	270,374	61,938	317,073	4.9	14.2	4.54	2.00	5.4	42½–31½	8.1
1977	834,895	41,733	608,654	2.5	241,432	45,957	288,782	5.0	14.5	4.23	1.75	4.9	39¼–31⅝	8.4
1976	777,315	34,910	554,741	3.0	200,349	38,989	265,913	4.5	13.1	3.56	1.54	4.8	37⅞–26¾	9.1
Reichhold Chemicals														
1979	$874,854	$12,230	$425,478	2.0	$179,960	$ 26,114	$194,619	1.4%	6.3%	$1.34	$0.74	5.4%	$16 –11¼	10.2
1978	753,885	12,038[f]	393,433	2.0	24,287	190,493	190,493	1.6	6.3	1.32[f]	0.74	5.4	16½–11	10.4
1977	673,942	13,711	383,055	2.0	173,135	26,222	186,499	2.0	7.4	1.70	0.74	4.5	20 –13¼	9.8
1976	585,129	16,085	324,024	2.0	158,499	21,757	144,398	2.7	11.1	2.33	0.70	4.4	19⅞–11⅝	6.8
Rohm & Haas Co.														
1979	$1,590,484	$95,495[g]	$1,191,903	2.3	$487,841	$ 68,328	$637,398	6.0%	15.0%	$7.39[g]	$1.76	4.4%	$48½–31½	5.4
1978	1,253,543	57,798[h]	1,074,656	2.3	464,335	66,431	557,511	4.6	10.4	4.49[h]	1.40	4.1	40¼–28⅛	13.1
1977	1,123,865	41,129[i]	1,019,736	2.5	483,248	78,915	520,236	3.7	7.9	3.20[i]	1.28	3.2	51½–28	11.2
1976	1,053,098	47,023[j]	1,085,227	2.0	483,310	110,840	501,223	4.5	9.4	3.66[j]	1.28	2.1	76¾–44½	16.6
Stauffer Chemical Co.														
1979	$1,526,160	$135,961	$1,846,866	1.7	$1,040,542	$239,303	$821,777	8.9%	16.5%	$3.10	$1.075	5.0%	$25 –17¾	6.9
1978	1,328,114	126,015	1,635,956	2.0	903,246	201,196	730,064	9.5	17.3	2.88	0.975	4.7	24⅝–17	7.2
1977	1,232,760	116,000[k]	1,412,754	2.7	782,060	193,436	659,839	9.4	17.6	2.66[k]	0.855	4.2	25 –15½	10.4
1976	1,100,000	113,016	1,251,480	3.1	662,832	198,775	580,022	10.3	19.5	2.60	0.68	2.8	27 –20¾	9.2

a Fiscal year ends June 30. b From continuing operations; excludes net income from ethical drug business of $554,000 ($0.06 per share) and net gain on sale of ethical drug business of $8.6 million ($0.91 per share). c Includes nonrecurring net charges for shutdown of European businesses of $53.2 million ($1.47 per share). d Includes net gain from divestiture of various businesses of $8.7 million. e From continuing operations; excludes net loss from discontinued Scientific Services operations of $14.5 million ($0.73 per share). f Includes loss on abandonment of phenol facility of $4.4 million ($0.38 per share). g Excludes extraordinary tax credit of $7.3 million ($0.57 per share). h From continuing operations; excludes provision for loss on disposal of discontinued operations of $2.5 million ($0.19 per share). i From continuing operations; excludes losses from operations and provision for loss on disposal of discontinued operations of $2.4 million ($0.18 per share). j From continuing operations; excludes losses from operations and provision for loss on disposal of discontinued fiber operations of $58.8 million ($1.12 per share). k Includes net gain on sale of Pasadena, Tex., fertilizer plant of $3.4 million.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
Money figures in thousands of dollars unless otherwise indicated														
Stepan Chemical Co.														
1979	$144,981	$4,794[a]	$112,700	2.3	$66,121	$13,575	$46,399	3.3%	10.3%	$2.56[a]	$0.83	4.2%	$23½–16⅜	7.8
1978	122,947	4,613	97,191	2.5	58,367	13,738	42,530	3.8	10.8	2.46	0.74	3.4	26⅞–16⅝	8.8
1977	108,951	5,625	81,743	2.0	49,322	16,181	39,195	5.2	14.4	3.00	0.63	3.1	24⅝–15⅝	6.7
1976	97,781	5,092	66,212	2.6	36,437	7,811	34,443	5.2	14.8	2.72	0.54	3.4	19¾–12	5.8
Terra Chemicals International														
1979	$254,109	$ 2,739	$137,775	2.6	$35,393	$2,670	$63,183	1.1%	4.3%	$0.29	$0.10	1.3%	$10½–5⅛	26.3
1978	198,901	1,277	134,292	2.3	37,674	9,339	52,132	0.6	2.1	0.01	0.70	9.0	10⅞–4⅝	—
1977	109,540	7,971	121,153	2.5	32,738	9,094	65,843	7.3	12.1	1.27	0.80	7.1	13⅜–9¼	8.9
1976	103,346	11,994	90,454	4.7	27,852	4,466	63,238	11.6	19.0	2.03	0.75	6.7	13½–9	5.5
Union Carbide Corp.														
1979	$9,176,500	$556,200[b]	$8,710,000	2.1	$4,458,300	$831,300	$3,949,900	6.1%	14.1%	$8.47[b]	$2.90	7.4%	$44½–34	4.6
1978	7,869,700	394,300[c]	7,776,000	2.0	4,118,900	687,800	3,548,300	5.0	11.1	6.09[c]	2.80	7.3	43¼–33⅜	6.3
1977	7,036,100	385,100[d]	7,328,600	2.1	3,840,800	805,400	3,312,400	5.5	11.6	6.05[d]	2.80	5.5	62⅜–40	8.5
1976	6,345,700	441,200[e]	6,606,400	2.3	3,375,500	964,500	3,039,900	7.0	14.5	7.15[e]	2.50	3.8	76¾–55⅜	9.3
Virginia Chemicals														
1979	$131,273	$4,240	$97,707	1.6	$54,341	$14,128	$31,356	3.2%	13.5%	$1.66	$0.64	4.7%	$16⅞–10⅜	8.2
1978	110,358	4,010	75,127	1.5	45,770	13,042	28,226	3.6	14.2	1.62	0.54	4.6	13⅜–10	7.2
1977	104,324	2,861	65,611	1.7	37,474	8,905	24,968	2.7	11.5	1.17	0.48	3.7	16–9⅝	11.0
1976	99,128	3,970	57,033	2.2	30,095	3,522	23,095	4.0	17.2	1.69	0.45	4.0	15–7⅞	6.6
Williams Cos.														
1979	$1,850,013	$69,450	$2,005,511	1.7	$1,190,526	$112,995	$737,949	3.8%	9.4%	$2.55	$1.00	4.2%	$32¼–15	9.3
1978	1,497,008	29,534[f]	2,075,114	1.6	1,223,884	131,940	705,567	2.0	4.2	1.09[f]	1.00	5.3	23⅝–14	17.3
1977	1,239,588	65,311	1,852,044	1.9	1,153,410	164,006	685,888	5.3	9.5	2.61	1.00	4.6	25⅞–18	8.4
1976	1,002,590	61,196	1,677,691	2.0	1,508,854	199,638	545,560	6.17	9.5	2.44	1.00	4.1	29–20	10.0
Witco Chemical Corp.														
1979	$966,758	$42,782	$551,891	1.9	$192,902	$40,890	$222,686	4.4%	19.2%	$4.83	$1.30	5.1%	$30½–20	5.2
1978	751,733	33,495	405,042	1.9	166,475	31,991	189,844	4.5	17.6	3.86	1.11	5.3	24⅞–16⅝	5.4
1977	632,412	24,643	340,654	2.5	135,180	29,404	167,384	3.9	14.7	2.87	0.97	5.1	22⅝–15⅝	6.6
1976	565,958	23,062	313,224	2.3	137,073	27,398	147,061	4.1	15.7	2.74	0.87	5.1	20–13⅝	6.2
PHARMACEUTICALS														
Abbott Laboratories														
1979	$1,683,168	$178,981[g]	$1,729,296	1.3	$466,970	$109,636	$896,028	10.6%	20.0%	$2.97[g]	$1.00	2.7%	$43⅜–29½	12.3
1978	1,445,017	148,625[h]	1,453,233	1.4	403,452	84,149	773,505	10.3	19.2	2.48[h]	0.78	2.4	40–25	13.1
1977	1,244,976	117,838	1,243,458	1.6	365,504	63,935	663,694	9.5	17.8	1.98	0.575	2.4	28⅝–19½	12.1
1976	1,084,856	92,467	1,076,183	2.0	325,238	53,355	574,903	8.5	16.1	1.63	0.455	2.0	27⅝–18⅞	14.2
American Home Products Corp.														
1979	$3,401,301	$396,039	$2,007,977	3.0	$408,899	$87,809	$1,239,315	11.6%	32.0%	$2.51	$1.50	5.6%	$29½–24⅜	10.7
1978	3,062,633	348,422	1,779,023	2.9	369,214	67,631	1,094,798	11.4	31.8	2.21	1.325	4.5	32¾–26⅛	13.3
1977	2,685,127	306,167	1,526,072	3.0	345,336	59,628	953,036	11.4	31.1	1.94	1.15	4.0	32⅛–24⅞	14.7
1976	2,471,727	277,931	1,425,705	3.2	324,011	52,706	906,335	11.2	30.7	1.75	1.00	3.0	37¾–28½	18.9
Baxter Travenol Laboratories														
1979	$1,191,193	$111,908[i]	$1,290,928	2.3	$500,976	$103,654	$723,510	9.4%	15.5%	$3.29[i]	$0.50	1.2%	$49½–35⅜	12.9
1978	1,004,196	91,683[j]	1,129,637	2.2	445,223	90,057	612,231	9.1	15.0	2.73[j]	0.40	1.0	49¾–32⅝	15.1
1977	844,446	75,120[k]	964,189	2.5	383,754	83,776	518,968	8.9	14.5	2.27[k]	0.285	0.8	40⅞–28¼	15.7
1976	681,364	60,395	837,247	2.7	337,060	71,474	440,479	8.9	13.7	1.85	0.22	0.5	46⅜–33	21.5
Bristol-Myers Co.														
1979	$2,752,777	$231,545	$1,837,648	2.4	$407,528	$95,022	$1,117,002	8.4%	20.7%	$3.50	$1.385	4.0%	$38¼–31	9.9
1978	2,450,429	203,048	1,619,015	2.3	358,515	81,922	981,624	8.3	20.7	3.08	1.19	3.5	40⅜–28	11.1
1977	2,191,433	174,261	1,422,181	2.3	313,846	70,439	839,279	8.0	20.8	2.72	1.05	3.2	35⅞–29¾	11.9
1976	1,986,370	156,806	1,257,633	2.3	264,662	44,856	733,194	7.9	21.4	2.45	0.90	2.5	41⅞–30⅝	14.8
Eli Lilly & Co.														
1979	$2,205,764	$329,531	$2,179,132	2.4	$672,610	$172,678	$1,570,439	14.9%	21.0%	$4.52	$1.95	3.5%	$63⅞–47⅛	12.3
1978	1,852,090	277,475	2,049,901	2.1	551,657	89,550	1,384,082	15.0	20.0	3.81	1.65	3.6	54–36⅝	11.9
1977	1,518,012	218,684	1,739,980	2.4	503,801	78,157	1,195,986	14.4	18.3	3.10	1.42	3.5	48¼–32⅝	13.0
1976	1,340,588	200,171	1,570,321	2.3	471,483	66,694	1,065,529	14.9	18.8	2.90	1.25	2.4	60–43	17.8

a Excludes nonrecurring net gain on sale of fragrance business of $528,000 ($0.28 per share). b Includes net charge on sales and disposals of assets of $21.1 million. c Includes net gain on sales of European ethylene derivatives business and other businesses of $54.4 million. d Includes net gain on sales and disposals of assets of $17.8 million. e Includes net gain on sales and disposals of assets of $16.8 million. f From continuing operations; excludes net loss from discontinued and disposed operations of $16.7 million ($0.62 per share). g Includes net gain on sale of animal health business of $1.8 million ($0.02 per share). h Includes net gain on sale of blood products business of $3.3 million ($0.03 per share). i Includes net gain on sale of assets of $450,000. j Includes net gain on sale of enzyme facilities of $700,000.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
Money figures in thousands of dollars unless otherwise indicated														
Merck & Co.														
1979	$2,384,627	$381,776	$2,614,064	2.2	$1,027,644	$170,134	$1,665,496	16.0%	22.9%	$5.06	$1.90	2.8%	$74¼–62½	13.5
1978	1,981,440	307,534	2,251,348	2.4	924,179	155,853	1,455,135	15.5	21.1	4.07	1.70	2.9	69¼–47⅝	14.3
1977	1,724,410	277,525[a]	1,993,389	2.5	846,784	177,167	1,277,753	16.1	21.7	3.67[a]	1.50	2.5	68¼–50	16.1
1976	1,661,514	255,482	1,791,883	2.3	747,107	153,894	1,102,154	15.4	23.2	3.38	1.40	1.9	81½–62⅝	21.3
Morton-Norwich Products														
1979[b]	$731,984	$46,088	$566,039	2.6	$223,224	$48,593	$297,777	6.3%	15.5%	$3.40	$1.26	4.2%	$34½–25¾	8.8
1978[b]	656,733	36,938	504,465	3.2	195,337	29,139	272,027	5.6	13.6	2.85	1.11	3.8	34⅞–23½	10.2
1977[b]	609,303	31,683	457,851	3.0	188,100	29,702	229,642	5.2	13.8	2.51	0.91	3.8	29½–18⅝	9.5
1976[b]	563,710	25,892[c]	417,832	3.5	179,011	46,726	205,245	4.6	12.6	2.06[c]	0.88	5.0	21⅝–13⅜	8.5
Pfizer Inc.														
1979	$2,746,025	$237,869	$2,945,280	2.0	$759,269	$133,300	$1,310,074	8.7%	18.2%	$3.26	$1.32	3.7%	$41¾–29	10.9
1978	2,362,133	206,256	2,643,611	2.0	709,957	110,100	1,149,537	8.7	17.9	2.93	1.17	3.6	39 –25½	11.0
1977	2,031,925	175,395	2,366,825	1.9	681,213	91,100	1,042,764	8.6	16.8	2.50	0.99	3.7	29½–23⅝	10.6
1976	1,887,507	159,928	2,103,133	2.2	661,666	82,000	952,844	8.5	16.8	2.28	0.86	3.0	31⅛–25⅝	12.4
Richardson-Merrell														
1979[b]	$1,090,546	$62,956	$718,229	2.1	$209,251	$47,545	$376,852	5.8%	16.7%	$2.66	$1.06	4.5%	$27 –19¼	8.8
1978[b]	944,961	66,179	631,801	2.0	192,413	29,681	333,005	7.0	19.9	2.80	0.90	3.5	31 –19⅞	9.1
1977[b]	836,004	57,180	564,287	2.5	171,283	27,550	314,701	6.8	18.2	2.42	0.70	3.1	26¼–18¾	9.3
1976[b]	745,877	48,376	508,306	2.3	161,580	20,407	271,738	6.5	17.8	2.05	0.64	2.6	27⅝–21⅛	11.9
A. H. Robins Co.														
1979	$386,425	$44,748[d]	$329,072	2.8	$59,994	$16,687	$222,148	11.6%	20.1%	$1.71[d]	$0.40	4.0%	$12 –8¼	5.9
1978	357,070	29,916	273,895	3.6	55,350	12,643	188,097	8.4	15.9	1.15	0.34	3.2	12⅞–8⅝	9.3
1977	306,713	26,801	233,401	3.4	49,751	11,601	165,598	8.7	16.2	1.03	0.32	2.7	14¼–9½	11.5
1976	284,925	31,355	209,709	3.9	39,066	5,443	147,843	11.0	21.2	1.20	0.30	2.7	12⅝–9½	9.3
Schering-Plough Corp.														
1979	$1,434,022	$222,267	$1,534,245	2.0	$415,401	$88,316	$1,037,354	15.5%	21.4%	$4.12	$1.39	4.4%	$35¼–27½	7.6
1978	1,082,493	193,629	1,183,919	2.7	319,551	51,336	848,558	17.9	22.8	3.62	1.21	3.8	38 –26¼	8.9
1977	940,859	166,652	1,055,087	2.4	295,284	51,572	803,675	17.7	20.7	3.08	1.09	3.0	44¾–27⅞	11.8
1976	871,537	157,094	936,548	2.6	269,255	57,509	694,585	18.0	22.6	2.91	0.94	1.9	60¼–40	17.2
G. D. Searle & Co.														
1979	$898,369	$89,004[e]	$1,099,383	1.9	$212,972	$49,253	$456,358	9.9%	19.5%	$1.66[e]	$0.52	3.3%	$20 –11½	9.5
1978	848,380	72,187	964,962	3.1	179,710	40,413	414,983	8.5	17.4	1.37	0.52	3.8	16⅝–10⅝	9.9
1977	846,931	30,610[f]	949,857	2.3	191,662	43,873	371,346	3.6	8.2	0.59[f]	0.52	4.2	13⅜–10⅞	20.9
1976	761,375	61,519	990,855	2.4	170,863	36,343	413,567	8.1	14.9	1.18	0.52	3.6	18 –10¾	12.2
SmithKline Corp.														
1979	$1,351,145	$233,837	$1,150,260	2.3	$289,847	$93,494	$667,468	17.3%	35.0%	$3.85	$1.32	2.6%	$53¼–38½	13.2
1978	1,112,039	164,075	894,224	2.4	224,929	75,579	503,770	14.8	32.6	2.72	0.78	2.1	51¼–23⅛	13.6
1977	780,337	89,271	702,199	2.4	176,936	45,216	376,260	11.4	23.7	1.49	0.54	2.7	25¼–15⅝	13.6
1976	673,501	72,027	620,770	2.4	150,507	30,045	315,222	10.7	22.8	1.21	0.50	2.8	20⅝–14⅝	14.6
Squibb Corp.														
1979	$1,782,894	$123,722	$1,747,688	2.2	$630,047	$109,970	$881,875	6.9%	14.0%	$2.71	$1.095	3.3%	$39¼–27	12.2
1978	1,515,882	117,255	1,541,165	2.2	559,090	108,046	793,219	7.7	14.8	2.60	1.035	3.5	37⅝–21⅜	11.3
1977	1,341,583	112,508	1,392,269	2.2	486,519	109,332	721,000	8.4	15.6	2.50	0.975	3.8	30⅞–21⅝	10.4
1976	1,214,509	108,160	1,200,772	2.5	408,207	59,438	651,046	8.9	16.6	2.40	0.915	2.8	38⅞–26¼	13.6
Sterling Drug														
1979	$1,500,692	$111,594	$1,105,581	2.3	$260,594	$58,186	$680,649	7.4%	16.4%	$1.85	$0.82	4.5%	$21⅜–15¼	9.9
1978	1,314,630	94,675	959,470	2.5	255,603	36,933	618,767	7.2	15.3	1.57	0.75	4.7	19¼–12⅝	10.2
1977	1,183,569	85,829	871,869	2.5	244,498	38,640	567,895	7.3	15.1	1.43	0.70	4.6	17 –13⅛	10.5
1976	1,095,753	82,759	797,308	2.5	214,190	33,826	521,831	7.6	15.9	1.39	0.70	3.9	21 –15	12.9
Upjohn Co.														
1979	$1,508,025	$149,478	$1,403,734	2.1	$476,367	$77,498	$743,559	9.9%	20.1%	$5.03	$1.62	3.6%	$50½–40	9.0
1978	1,328,551	129,405	1,207,625	2.3	437,803	44,681	639,753	9.7	20.2	4.36	1.37	3.1	56 –32⅛	10.1
1977	1,134,325	91,521	1,048,179	2.6	429,305	41,425	548,989	8.1	16.7	3.09	1.17	3.4	38⅞–30	11.1
1976	1,025,536	77,579	959,300	2.6	420,513	53,815	490,336	7.6	15.8	2.62	1.02	2.5	48½–34⅛	15.8
Warner-Lambert Co.														
1979	$3,217,208	$123,348[g]	$2,542,167	1.9	$775,253	$155,473	$1,067,151	3.8%	11.6%	$1.55[g]	$1.29	5.9%	$26½–17¾	14.3
1978	2,878,496	207,947	2,318,839	2.0	715,880	133,748	1,026,713	7.2	20.3	2.61	1.175	4.2	32½–22⅞	10.6
1977	2,542,728	187,616	1,965,969	2.6	590,014	103,494	1,117,896	7.4	16.8	2.36	1.075	3.9	31⅝–23⅞	11.8
1976	2,349,198	159,661	1,870,387	2.8	511,442	82,535	1,125,476	6.8	14.2	2.01	0.98	3.0	38½–27½	16.4

a Excludes extraordinary net gain on sale of Calgon consumer products business of $13.2 million ($0.18 per share). b Fiscal year ends June 30. c From continuing operations; excludes net loss from nonrecurring and extraordinary items of $32.6 million ($2.59 per share). d Includes income, before taxes, from settlement of antitrust litigation of $28.9 million. e From continuing operations; excludes net loss from operations of divested diagnostic businesses of $1.1 million ($0.02 per share). f Excludes provision for loss on disposal of assets of businesses being divested of $59.0 million ($1.12 per share). g Includes net nonrecurring charges and tax settlement of $64 million ($0.80 per share).

SECTION 3 PERFORMANCE BY THE U.S. CHEMICAL INDUSTRY

Productivity growth, capacity use may pose problems

Despite the chemical industry's strong profits in 1979 and early 1980, other measures of performance don't show up as well. Some important indicators of efficiency, in fact, are hinting at either short- or long-term problems.

One long-term problem for the chemical industry, as for most U.S. manufacturing, lies in labor productivity and unit labor costs. In 1979, productivity was up 5% in the chemicals and allied products industry and just 2% in all manufacturing. Both of these increases are below average for the past 10 years.

At the same time, large increases in hourly pay last year pushed up unit labor costs: 4% in chemicals and allied products and 6% for all manufacturing.

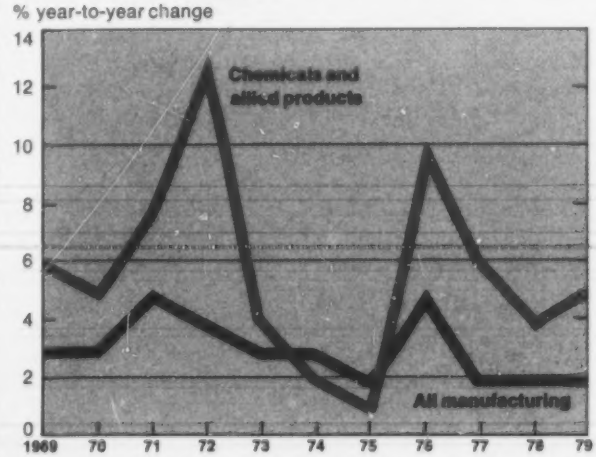
In addition, operating rates in the chemical industry's plants peaked at a high 82% of nameplate capacity in mid-1979 for the more basic chemical products. By the first quarter of 1980, they had declined to 79% as production of many products stopped expanding and some new plant capacity came on stream. This lower rate suggests that the industry may not enjoy this year the considerable economic efficiencies that it had from high plant use in 1979.

PRODUCTIVITY: Chemical industry does considerably better than average for all manufacturing

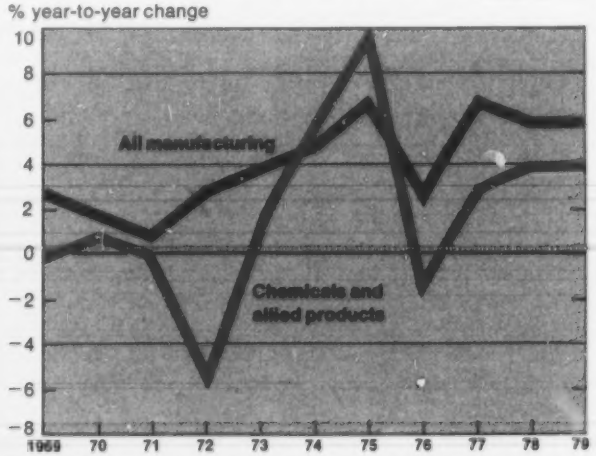
Indexes, 1967 = 100	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969
CHEMICALS AND ALLIED PRODUCTS											
Production	210.4	197.4	185.7	170.9	147.2	159.4	154.4	143.6	125.9	120.4	118.4
Workhours	108.3	106.2	104.2	101.4	96.5	105.1	103.7	100.3	99.2	102.0	105.6
Productivity	194.3	185.9	178.2	168.5	152.5	151.7	149.0	143.2	126.9	118.0	112.1
Hourly production wages	244.8	226.1	207.4	190.7	173.9	157.4	145.5	137.4	128.0	119.0	111.9
Unit labor costs	126.0	121.6	116.4	113.2	114.0	103.8	97.7	96.0	101.0	100.9	99.8
ALL MANUFACTURING											
Production	153.2	146.8	138.4	130.3	116.3	129.4	129.8	118.9	108.2	106.4	111.0
Workhours	103.9	101.7	98.0	94.2	88.6	100.9	104.0	98.1	93.0	96.3	103.3
Productivity	147.5	144.4	141.2	138.3	128.3	124.8	121.2	116.3	110.5	107.5	104.3
Hourly production wages	237.2	218.8	201.4	185.1	171.3	156.7	145.0	135.5	126.6	118.8	113.1
Unit labor costs	160.8	151.5	142.6	133.8	130.5	122.1	116.2	111.8	108.9	107.5	105.2

Sources: Department of Labor, Federal Reserve Board, C&EN calculations

Productivity edges up for chemicals . . .



. . . while unit labor costs rise at steady rate



Note: Productivity is output per workhour, calculated by dividing indexes for production by indexes for workhours of production employees. Unit labor costs are labor costs per unit of output, calculated by dividing indexes for wages by indexes for output per workhour. **Sources:** Department of Labor, Federal Reserve Board, C&EN calculations

OPERATING RATES: Use of plant capacity for basic chemicals has fallen from 1979 peak

Billions of lb per year unless otherwise noted[a]	1ST-QTR 1980		3RD-QTR 1979		1ST-QTR 1979		3RD-QTR 1978		1ST-QTR 1978		3RD-QTR 1977	
	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use	Capacity[b]	Use
ORGANIC CHEMICALS												
Benzene (bg)	2.6	70%	2.3	77%	2.3	70%	2.2	67%	2.2	73%	2.0	75%
Butadiene[c]	4.7	75	4.0	90	4.3	78	4.3	82	4.3	82	3.8	79
Cyclohexane	3.2	85	3.2	78	3.2	76	3.2	63	3.2	72	2.9	79
DMT-PTA[d]	7.3	75	7.3	68	7.3	68	6.6	72	6.5	72	6.4	77
Ethylene	39.8	78	36.5	89	35.2	85	32.5	80	32.5	79	30.1	81
Formaldehyde, 37% solution	8.5	72	8.5	79	8.5	79	8.7	74	8.7	74	8.8	67
Methanol (bg)	1.35	83	1.4	85	1.4	78	1.4	71	1.4	79	1.3	69
Phenol	3.6	81	3.4	82	3.4	82	3.5	75	3.5	69	3.0	80
Propylene, chemical	23.4	62	20.5	72	20.0	72	19.0	68	19.0	68	17.6	72
Propylene oxide	3.0	68	3.0	83	3.0	85	3.0	67	3.0	67	2.6	73
Styrene	9.3	87	8.4	89	8.2	88	8.7	80	8.7	83	8.2	83
Urea	7.7	86	7.5	87	7.5	80	6.2	82	7.3	62	6.4	70
Vinyl chloride	8.7	89	8.4	99	8.8	90	8.8	71	7.8	80	7.0	86
***p*-Xylene**	5.3	70	5.7	79	4.3	84	4.3	71	4.5	71	4.5	80
INORGANIC CHEMICALS												
Ammonia (mt)	20.4	95	20.4	91	21.0	74	19.0	88	22.4	75	21.5	79
Carbon black	4.3	74	4.3	73	4.3	91	4.0	83	4.0	83	4.0	80
Carbon dioxide (ttd)	14.1	69	12.5	52	12.5	65	15.7	51	11.5	50	14.7	51
Chlorine (mt)	14.4	84	14.4	88	14.3	83	13.9	81	13.7	76	13.5	77
Nitrogen, **Oxygen** } total, liquid (ttd)	32.4	68	31.2	67	30.7	67	31.5	57	25.0	77	27.7	70
Phosphoric acid, (P_2O_5) (mt)	11.0	94	9.8	94	10.2	95	9.8	88	9.8	84	9.9	87
Phosphorus (mt)	0.55	83	0.55	78	0.55	83	0.55	82	0.55	78	0.55	70
Sodium carbonate (mt)	9.7	85	9.1	92	8.6	90	9.4	87	9.4	97	9.8	83
Sodium hydroxide (mt)	15.5	79	15.1	85	15.0	76	14.6	77	14.4	79	14.0	79
Sulfuric acid (mt)	57.5	76	56.0	81	56.0	75	55.5	67	55.3	63	54.5	61
Titanium dioxide (mt)	1.04	75	0.88	88	0.88	82	0.94	80	0.94	77	0.96	76
AVERAGE		**79%**		**82%**		**80%**		**75%**		**75%**		**76%**

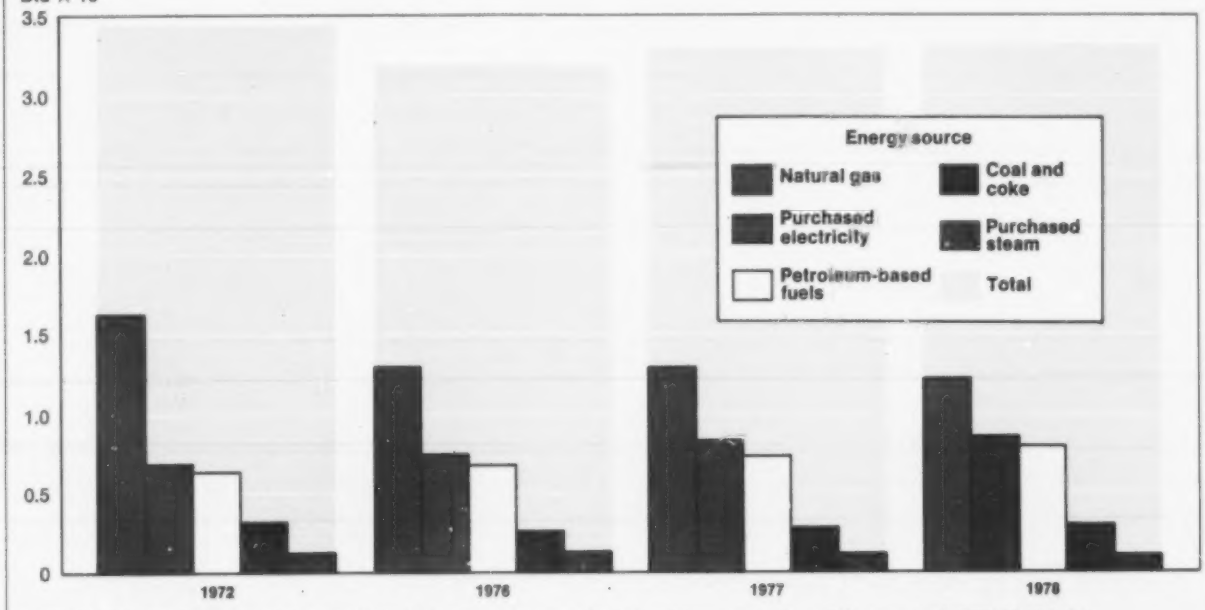
a bg = billions of gallons, mt = millions of tons, ttd = thousands of tons per day, mlt = millions of long tons. b Nameplate capacity. c Based on extraction capacity of steam-cracking plants and dehydrogenation capacity only of dehydrogenation producers; capacity could be more if extraction capacity of dehydrogenation plants were included. d Dimethyl terephthalate-purified terephthalic acid, not including acid converted to dimethyl terephthalate. **Sources:** Industry sources, C&EN estimates

Plant utilization also is down slightly for industry overall

	Operating rate, % of nameplate capacity, as of December										
	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969
Chemicals	83%	83%	76%	78%	78%	81%	88%	85%	81%	80%	84%
Paper	91	89	87	85	85	84	93	91	87	86	92
Petroleum	86	91	91	93	91	90	95	94	93	95	98
Rubber	70	84	81	85	81	77	84	89	86	83	87
Textiles	82	85	87	84	85	69	89	91	86	81	87
All manufacturing	81	84	82	81	79	78	85	85	80	80	84

Source: Department of Commerce

Chemical industry uses slightly less energy now than before 1973 oil embargo



Note: Data from firms accounting for more than 80% of U.S. capacity for energy for fuel and process use only; exclude energy equivalent of feedstocks.
Source: Chemical Manufacturers Association

ENERGY USE BY CHEMICAL INDUSTRY: Drop for gas largely offset by electricity and oil

Energy source	1978 Trillion Btu	1978 % of total	1977 Trillion Btu	1977 % of total	1976 Trillion Btu	1976 % of total	1972 Trillion Btu	1972 % of total	Change 1972–78 Trillion Btu	Change 1972–78 % of total
Natural gas	1237	37.1%	1306	39.4%	1310	40.9%	1632	47.3%	−394	−24.2%
Purchased electricity[a]	876	26.3	848	25.6	769	24.0	709	20.6	167	23.6
Petroleum-based fuels	800	24.0	746	22.5	697	21.7	649	18.8	151	23.3
Light hydrocarbons	370	11.1	301	9.1	377	11.7	358	10.4	12	3.4
Residual fuels	269	8.1	241	7.3	192	6.0	194	5.6	75	38.7
Distillate fuels	64	1.9	79	2.4	54	1.7	33	1.0	31	93.9
Other liquids, solids	98	2.9	124	3.8	74	2.3	64	1.9	34	53.1
Coal and coke	305	9.1	295	8.9	287	8.9	327	9.5	−22	−6.7
Purchased steam	117	3.5	120	3.6	144	4.5	133	3.9	−16	−12.0
TOTAL	**3335**	**100.0%**	**3315**	**100.0%**	**3208**	**100.0%**	**3449**	**100.0%**	**−114**	**−3.3%**

a Electricity is calculated as fuel value of 10,000 Btu to generate 1 kwh instead of using standard conversion factor of 3412 Btu per kwh. **Note:** Data from companies accounting for more than 80% of U.S. capacity for basic industrial chemicals; for energy and process use only, excluding energy equivalent of feedstock. **Source:** Chemical Manufacturers Association

ENERGY USE BY PETROLEUM INDUSTRY: Oil accounts for more than half

Energy source	1978 Trillion Btu	1978 %	1977 Trillion Btu	1977 %	1976 Trillion Btu	1976 %	1972 Trillion Btu	1972 %	Change 1972–78 Trillion Btu	Change 1972–78 %
Natural gas	676	23%	761	25%	733	26%	930	32%	−254	−27%
Purchased electricity[a]	231	8	230	8	211	8	174	6	57	33
Petroleum-based fuels	1628	54	1534	51	1438	51	1366	47	262	19
Light hydrocarbons	1287	43	1192	40	1127	40	1075	37	212	20
Residual fuels	306	10	311	10	282	10	262	9	44	17
Distillate fuels	29	1	26	1	28	1	29	1	0	0
Other fuel	6	—	4	—	0	0	0	0	6	—
Coal and coke	425	14	454	15	423	15	436	15	−11	−2
Purchased steam	38	1	38	1	14	—	na	na	na	na
TOTAL	**2998**	**100%**	**3018**	**100%**	**2819**	**100%**	**2906**	**100%**	**92**	**3%**

a Electricity is calculated as fuel value of 10,000 Btu to generate 1 kwh instead of using standard conversion factor of 3412 Btu per kwh. na = not available. **Note:** Data from companies accounting for more than 90% of U.S. petroleum refining capacity; for energy and process use only, excluding energy equivalent of feedstock. **Sources:** American Petroleum Institute, Department of Energy

SECTION 4

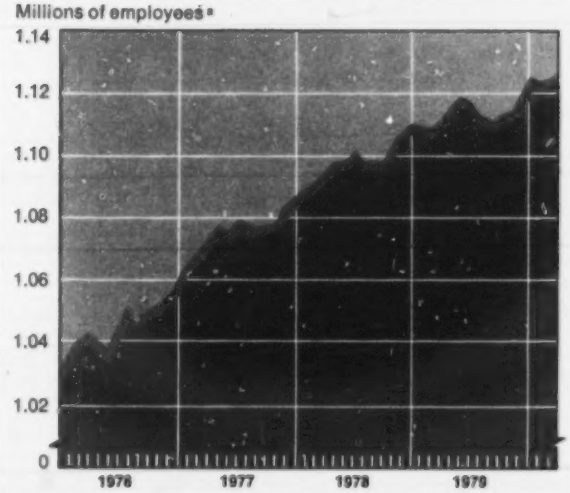
EMPLOYMENT IN THE U.S. CHEMICAL INDUSTRY

Chemical employment up another notch

More people are at work in the chemical industry than ever before. The number of jobholders, in fact, has been expanding relatively steadily ever since the trough of the 1975 recession to a level now nearly 12% higher than its low point then. Not all segments of the industry have done equally well in creating new jobs, however. Since early 1975, employment has grown more than 15% in inorganic chemicals and in pharmaceuticals. But it has changed hardly at all in plants making plastics materials and synthetic fibers. In fact, the number of plastics and fibers employees is below the mid-1974 peak of more than 250,000.

Meanwhile, in recent years the chemical industry has been expanding its scientific staffs faster than employment as a whole. In the past decade, while total employment increased 5%, the number of scientists and engineers working in the industry rose nearly a fourth.

Jobs in the chemical industry climb shakily



a Seasonally adjusted employment in U.S. chemicals and allied products industry.
Source: Department of Labor

INDUSTRIAL EMPLOYMENT: Plastics production is largest source of jobs for chemical workers

	All employees[a] (thousands)				Production workers[a] (thousands)				Workweek[a,b] (hours)			
	1979	1978	1977	1969	1979	1978	1977	1969	1979	1978	1977	1969
All manufacturing	20,972	20,476	19,682	20,167	15,010	14,714	14,135	14,767	40.2	40.4	40.3	40.6
Chemicals and allied products	1,113	1,096	1,074	1,060	637	628	616	622	41.8	41.9	41.7	41.8
Industrial inorganic chemicals	171	166	162	na	93	94	95	na	42.1	42.2	41.9	na
Plastics materials and synthetics	217	216	214	240	148	146	142	148	42.1	42.4	41.8	42.2
Drugs	191	186	181	143	94	90	90	71	41.1	41.3	41.0	41.0
Soap, cleaners, and toilet goods	138	136	130	124	84	83	78	73	40.5	40.6	40.7	40.9
Paints and allied products	70	69	66	72	36	36	35	40	41.1	41.5	41.2	41.0
Industrial organic chemicals	166	166	166	na	86	86	84	na	43.4	42.5	42.7	na
Agricultural chemicals	69	68	67	na	44	42	42	na	42.9	42.6	43.0	na
Miscellaneous chemical products	91	90	87	na	51	51	50	na	41.5	41.6	41.8	na
Petroleum and coal products	214	209	202	182	140	136	131	112	43.8	43.6	42.7	42.6
Rubber and miscellaneous plastics products	768	752	714	596	601	589	558	462	40.5	40.9	41.0	41.1

a Domestic employment. b Workweek of production or nonsupervisory workers. **na** = not available. **Source:** Department of Labor

EMPLOYMENT OF SCIENTISTS AND ENGINEERS: More than 10% work in chemicals

Thousands[a]	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969
Total, all industry	427.8	403.7	382.8	364.4	363.3	360.0	357.7	350.2	367.0	384.2	387.1
Chemicals and allied products	49.4	47.9	46.4	44.4	45.2	41.8	40.9	41.0	42.7	40.1	40.0
Industrial chemicals	21.8	21.5	20.6	20.1	21.1	19.1	19.1	19.1	21.8	21.5	22.3
Drugs and medicines	19.9	18.9	17.8	16.6	15.6	14.0	13.0	13.1	12.3	11.8	10.2
Other chemicals	7.6	7.4	8.0	7.8	8.5	8.7	8.8	8.8	8.6	6.8	7.5
Petroleum refining	10.8	10.0	8.9	8.6	8.4	8.2	8.2	8.3	9.2	9.9	10.0
Rubber products	na	7.9	9.1	8.6	8.4	7.7	7.5	6.7	6.7	7.4	6.6

a Full-time-equivalent number of R&D scientists and engineers in industry, as of January of each year. **na** = not available. **Source:** National Science Foundation

COMPANY EMPLOYMENT: Big gains at Allied Chemical and Grace boost industry totals

Thousands	Worldwide employment									
	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Air Products	14.6	14.3	13.7	13.4	13.0	13.0	10.3	9.0	9.2	9.1
Akzona	15.4	15.3	15.6	15.6	15.8	19 5	19.6	17.7	16.6	13.3
Allied Chemical	49.0	32.0	32.8	33.4	33.4	32.2	33.5	32.7	34.0	32.8
American Cyanamid	44.2	44.0	43.8	39.4	37.8	38.0	39.5	41.4	41.4	38.0
Cabot	8.1	7.9	5.6	5.6	5.6	6.3	6.6	6.6	6.9	7.2
Celanese	33.3	33.2	32.1	31.9	37.0	38.8	37.4	36.2	36.5	34.6
Crompton & Knowles	3.0	3.2	3.1	3.0	2.2	2.4	2.5	2.6	2.8	2.7
Diamond Shamrock	12.4	12.9	12.3	11.4	10.9	9.8	9.3	8.7	8.5	8.7
Dow Chemical	55.9	53.5	53.2	53.0	53.0	53.3	49.8	48.8	47.8	47.4
Du Pont	134.2	131.8	132.0	132.5	134.6	135.2	129.1	122.3	122.2	129.1
Ethyl Corp.	16.0	16.5	16.0	16.0	17.0	18.0	14.0	14.0	13.0	14.0
Ferro	9.1	8.4	8.2	7.4	7.7	8.0	7.5	6.9	6.3	5.9
Freeport Minerals	3.9	3.5	3.7	3.8	3.5	3.3	2.9	2.3	2.3	2.4
W. R. Grace	82.1	68.5	68.7	63.8	65.3	79.1	75.7	73.9	66.9	63.9
Hercules	24.4	24.5	24.0	24.0	23.5	25.3	24.1	22.4	22.1	23.2
International Flavors	3.6	3.5	3.3	3.1	2.9	3.1	2.8	2.7	2.7	2.7
International Minerals	10.3	9.9	9.9	9.7	10.5	6.6	6.2	6.2	7.0	7.8
Lubrizol	3.9	3.8	3.6	3.6	3.6	3.5	3.3	3.0	3.0	2.9
Mallinckrodt	4.8	4.9	4.3	4.3	3.9	3.7	3.1	2.9	2.8	2.9
Monsanto	63.9	62.9	61.5	61.9	59.2	60.9	58.3	57.9	59.3	62.9
Nalco Chemical	4.1	4.1	4.2	3.8	3.5	3.4	3.2	2.9	2.7	2.6
National Distillers	15.7	16.1	13.1	13.3	13.6	14.3	16.0	16.9	17.6	17.3
Olin	21.7	22.7	22.4	22.0	23.0	23.0	24.0	32.0	31.0	29.0
Pennwalt	13.3	14.0	13.9	13.9	14.3	14.8	13.9	12.8	13.0	13.4
Reichhold Chemicals	6.4	6.5	6.5	5.8	4.3	4.1	4.3	3.4	3.4	3.6
Rohm & Haas	13.3	13.1	13.0	13.3	13.8	14.2	13.5	13.1	12.7	13.0
Stauffer Chemical	13.8	13.1	13.0	13.0	13.1	12.5	12.0	11.3	10.5	11.6
Stepan Chemical	0.9	0.8	0.8	0.7	0.7	0.8	0.7	0.6	0.6	0.6
Texasgulf	5.9	5.5	5.4	5.3	4.9	4.3	4.0	3.8	3.3	3.3[a]
Union Carbide	115.8	113.4	113.7	113.1	106.5	109.6	109.4	98.1	99.2	102.1
TOTAL EMPLOYEES	803.0	767.9	753.4	741.4	738.2	761.0	736.6	720.9	712.8	708.0
ANNUAL CHANGE	4.6%	1.9%	1.6%	0.4%	−3.0%	3.3%	2.2%	1.1%	0.7%	−3.0%
SALES PER EMPLOYEE ($ thousands)	$97.2	$89.9	$75.9	$69.7	$54.2	$58.5	$46.2	$41.2	$36.1	$34.6

a C&EN estimate.

WAGES: More than doubled in a decade for blue-collar workers

	Hourly earnings[a]				Weekly earnings[a]			
	1979	1978	1977	1969	1979	1978	1977	1969
All manufacturing	$6.69	$6.17	$5.68	$3.19	$268.94	$249.27	$228.90	$129.51
Chemicals and allied products	7.59	7.01	6.43	3.47	317.26	293.72	268.13	145.05
Industrial inorganic chemicals	8.26	7.63	6.99	na	347.75	321.99	292.88	na
Plastics materials and synthetics	7.41	6.87	6.29	3.40	311.96	291.29	262.92	143.48
Drugs	6.94	6.42	5.99	3.30	285.23	265.15	245.59	135.63
Soap, cleaners, and toilet goods	7.18	6.69	6.13	3.42	290.79	271.61	249.49	139.88
Paints and allied products	6.78	6.34	5.91	3.29	278.66	263.11	243.49	134.89
Industrial organic chemicals	9.01	8.22	7.42	na	391.03	349.35	316.83	na
Agricultural chemicals	7.29	6.68	6.03	na	312.74	248.57	259.29	na
Miscellaneous chemical products	7.07	6.54	6.02	na	293.41	272.06	251.64	na
Petroleum and coal products	9.37	8.63	7.83	4.00	410.41	376.27	334.34	170.40
Rubber and miscellaneous plastics products	5.96	5.52	5.17	3.07	241.38	225.77	211.97	126.18

a For production and nonsupervisory workers in domestic employment. **na** = not available. **Source:** Department of Labor

SECTION 5 **FOREIGN TRADE OF THE U.S. CHEMICAL INDUSTRY**

U.S. chemical trade surplus near $10 billion

Chemicals continue to be one of the few bright spots in an overall dismal U.S. trade picture. Although the deficit in the U.S. balance of trade last year, $24.7 billion, was an improvement over the $28.5 billion deficit in 1978, it is still a lot of red ink, thanks in large measure to increasingly expensive oil imports.

But those same high world oil prices that contributed to the U.S. trade deficit proved to be a boon to U.S. chemical exporters. With their feedstock costs based on lower domestic oil prices and even less expensive light feeds from natural gas, they managed to increase chemical exports a whopping 37%.

Last year's chemical exports hit a record $17.3 billion and with imports growing only 16.5% to $7.5 billion, the U.S. chemical industry was able to boost its trade surplus to $9.8 billion, also a new record.

By comparison, West Germany, which is the world's largest single chemical exporting country with $22.4 billion in such shipments, managed to raise its chemical exports only 16.5% last year. And while West Germany's share of the world chemical export market was slipping, the U.S. share increased, from 14.4% in 1978 to 15.1% last year.

However, the feedstock cost advantage that contributed so strongly to last year's strong export performance by the U.S. chemical industry also has created problems. Stung by increasingly large shipments of synthetic fibers from the U.S., particularly to Britain and Italy, the European Economic Community and some individual members have taken steps to curb imports. Quotas have been imposed and antidumping duties have been applied.

The U.S.-EEC trade hassle now is spilling over into chemicals. U.S. imports of liquid nitrogen fertilizer, vinyl acetate, and styrene already are under investigation in EEC.

U.S. TOTAL TRADE BALANCE: Three years of deep deficit

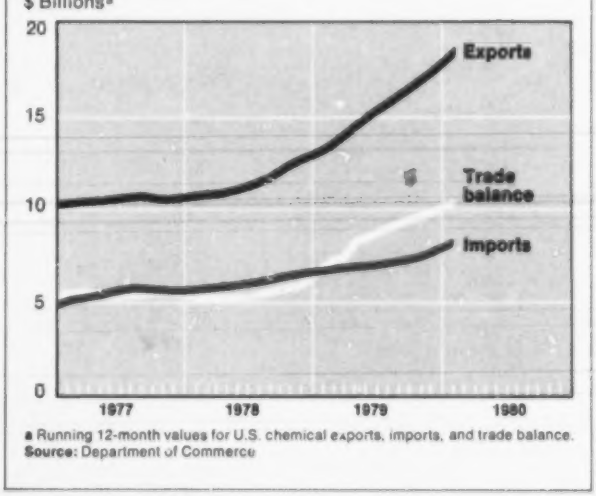
$ Millions	1979	1978	1977	1969
Exports[a]	$181,639	$143,575	$121,150	$37,322
Imports[b]	206,327	172,026	147,685	36,043
Trade balance	−24,688	−28,451	−26,535	1,289

a Exports of domestic and foreign merchandise, excluding Department of Defense and Grant-Aid shipments. FAS value (free alongside ship). b General imports. Starting in 1974 reported as FAS value. Prior to 1974 reported as foreign value, which is within 1% of FAS value. c Exports of domestic merchandise, including Department of Defense and Grant-Aid shipments. **Source:** Department of Commerce

U.S. CHEMICAL TRADE BALANCE: One year of strong improvement

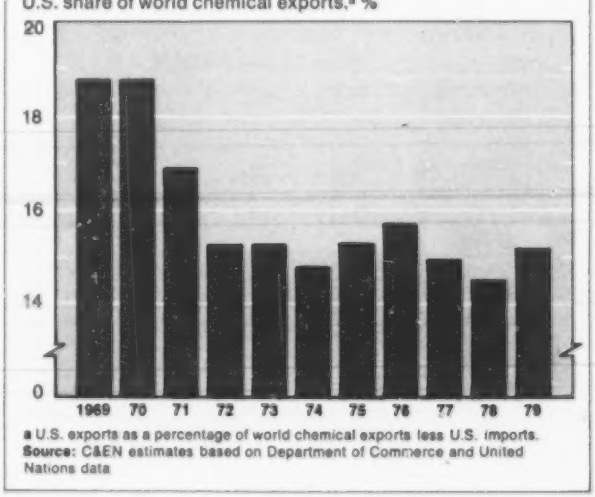
$ Millions	1979	1978	1977	1969
Chemical exports[c]	$ 17,306	$ 12,618	$ 10,827	$ 3,383
Chemical imports[b]	7,485	6,427	5,432	1,232
Chemical trade balance	9,821	6,191	5,395	2,151

U.S. chemical trade balance rises sharply



a Running 12-month values for U.S. chemical exports, imports, and trade balance. **Source:** Department of Commerce

U.S. chemicals hold share of world market



a U.S. exports as a percentage of world chemical exports less U.S. imports. **Source:** C&EN estimates based on Department of Commerce and United Nations data

WORLD TRADE: West Germany keeps lead

$ Millions	1979	1978	1977	1969
CHEMICAL EXPORTS				
World	$122,500[a]	$94,053	$77,890	$21,880
U.S.	17,306	12,618	10,827	3,383
Canada	2,995	2,111	1,696	456
EC, nine countries[b]	68,038	52,078	43,362	10,015
Belgium-Luxembourg	6,644	5,701	4,620	809
France	11,632	8,835	7,162	1,589
Italy	4,532	3,710	3,156	820
Netherlands	10,315	7,425	6,321	1,297
U.K.	10,405	8,064	6,753	1,644
West Germany	22,397	18,835	14,216	3,590
Switzerland	4,885	4,804	3,580	986
Japan	6,100	5,102	4,300	1,016
CHEMICAL IMPORTS				
World	—	—	—	—
U.S.	7,485	6,427	5,432	1,232
Canada	3,340	2,556	2,347	703
EC, nine countries[b]	50,382	36,682	30,273	7,114
Belgium-Luxembourg	5,352	4,627	3,359	725
France	9,847	7,280	5,948	1,349
Italy	6,898	4,725	3,776	975
Netherlands	5,752	4,175	3,635	917
U.K.	7,292	5,293	4,303	1,111
West Germany	12,388	8,785	7,503	1,560
Switzerland	2,870	2,421	2,012	545
Japan	5,178	3,763	3,003	783

a C&EN estimate. b European Communities; historical data have been adjusted to reflect present nine member countries. **Sources:** United Nations, Organization for Economic Co-operation & Development, European Communities, individual country data

U.S. TRADE: Europe takes a third

$ Millions	1979	1978	1977	1969
U.S. CHEMICAL EXPORTS				
Canada	$ 1,991	$ 1,739	$ 1,539	$ 510
Western Europe	5,585	4,275	3,737	1,239
Eastern Europe	200	62	78	35
Communist Asia	125	61	20	—
Japan	1,652	1,104	977	304
Rest of Asia	2,204	1,324	955	337
Middle East	387	367	269	55
Latin America	3,814	2,679	2,350	613
Australasia	608	417	384	96
Africa	465	349	309	101
Other	272	241	209	93
TOTAL	**$17,306**	**$12,618**	**$10,827**	**$3,383**
U.S. CHEMICAL IMPORTS				
Canada	$2362	$1805	$1451	$310
Western Europe	3449	3227	2465	538
Eastern Europe	107	78	33	8
Communist Asia	60	34	22	0
Japan	616	563	465	121
Rest of Asia	148	124	89	13
Middle East	48	41	35	3
Latin America	405	312	212	58
Australasia	158	115	402	91
Africa	49	46	46	20
Other	83	82	212	70
TOTAL	**$7485**	**$6427**	**$5432**	**$1232**

Source: Department of Commerce

U.S. CHEMICAL EXPORTS:[a] Plastics surge

Classification	$ Millions 1979[b]	1978[b]	1977	1969
Organic chemicals	$5,055	$3,369	$3,286	$968
Inorganic chemicals	1,712	1,207	1,047	374
Uranium, thorium, cerium, radioactive and nonradioactive; isotopes	973	717	551	103
Dyeing, tanning, and coloring materials	177	145	126	36
Pigments, paints, and varnishes	273	241	227	85
Medicinals and pharmaceuticals	1,591	1,404	1,080	363
Flavors, perfumes, cosmetics, and toiletries	399	356	274	83
Cleaning and polishing materials	290	250	195	79
Fertilizers, manufactured	1,404	1,091	701	218
Explosives and pyrotechnics	62	65	78	17
Plastics and resins	3,241	2,088	1,732	590
Pesticides and disinfectants	516	445	c	c
Miscellaneous	1,649	1,240	1,530	467
TOTAL	**$17,306**	**$12,618**	**$10,827**	**$3,383**

a Exports of domestic merchandise, including Department of Defense and Grant-Aid shipments. FAS (free alongside ship) value. b As a result of statistical reclassification, 1978 and 1979 data are not directly comparable to those of previous years. C&EN has rearranged past data to make them as comparable as possible. c Included in miscellaneous. **Source:** Department of Commerce

U.S. CHEMICAL IMPORTS:[a] Organics are top

Classification	$ Millions 1979[b]	1978[b]	1977	1969
Organic chemicals	$2159	$1734	$1437	$322
Inorganic chemicals	1106	915	1175	303
Uranium, thorium, cerium, radioactive and nonradioactive; isotopes	953	912	484	28
Dyeing, tanning, and coloring materials	185	171	142	74
Pigments, paints, and varnishes	76	63	44	9
Medicinals and pharmaceuticals	441	449	318	83
Flavors, perfumes, cosmetics, and toiletries	263	230	175	64
Cleaning and polishing materials	73	62	49	10
Fertilizers, manufactured	976	869	829	137
Explosives and pyrotechnics	58	43	36	35
Plastics and resins	626	518	389	99
Pesticides and disinfectants	190	159	c	c
Miscellaneous	379	303	354	68
TOTAL	**$7485**	**$6427**	**$5432**	**$1232**

a General imports, FAS (free alongside ship) value. b As a result of a statistical reclassification, 1978 and 1979 data are not directly comparable to those of previous years. C&EN has rearranged past data to make them as comparable as possible. c Included in miscellaneous. **Source:** Department of Commerce

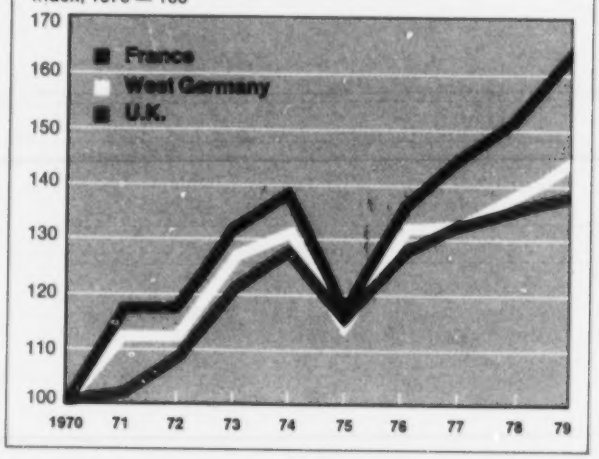
Managers of European chemical companies were pleasantly surprised with the outcome of business last year. Instead of the downturn that had been widely feared, sales moved ahead.

There were complaints that profit margins weren't higher. But after-tax profits generally were up from 1978. Of 17 major West European companies, only four had a decline. Italy's Montedison's profit last year, though modest, was a heartening turnaround from the losses of the four previous years. There were strong gains, meanwhile, by Akzo, DSM, UCB, and Rhône-Poulenc.

Chemical prices and production rose in France, West Germany, and the U.K. in 1979. The number of workers employed in chemical plants increased a few thousand in the U.K., remained about the same in West Germany, and fell about 5000 in France.

Man-made fibers continued to be a problem area, however. Production of noncellulosics throughout Western Europe last year totaled about 5.2 billion lb, against 5.1 billion lb in 1978. Cellulosics output remained unchanged at about 1.9 billion lb.

Chemical production continues to rise



PRODUCTION: Declines were few for major chemicals in 1979

Millions of lb	1979	1978	1977	1976	Change 1978–79
U.K.					
Sulfuric acid	7,696	7,599	7,489	7,192	1%
Hydrochloric acid	299[a]	290	308	304	3
Chlorine	2,237[a]	2,112	2,275	2,319	6
Ethylene	2,523[a]	2,411	2,504	2,829	5
Benzene	2,442[a]	1,947	2,136	2,323	25
Phenol	407[a]	372	370	407	9
Phthalic anhydride	213[a]	200	218	220	7
Carbon black	453[a]	438	425	471	3
Plastics	3,632[a]	3,491	3,509	3,529	4
Polyethylene	1,014[a]	942	1,074	1,043	8
Polypropylene	616[a]	642	546	552	−4
Polystyrene	486[a]	460	504	526	6
Polyvinyl chloride	937[a]	902	849	917	4
Synthetic rubber	662[a]	645	704	704	3
Nitrogen fertilizers (N)	1,483[a]	1,313	1,393	1,199	13
Phosphate fertilizers (P_2O_5)	942[a]	920	990	880	2
Detergents	1,973[a]	1,734	1,714	1,659	14
WEST GERMANY					
Sulfuric acid	9,046	8,400	8,404	8,411	8%
Chlorine	7,075	6,624	6,193	6,173	7
Ammonia	4,754	4,301	4,376	4,099	11
Sodium carbonate	3,038	2,699	2,955	3,007	13
Sodium sulfate	458	464	530	563	−1
Ethylene	7,803	7,093	6,525	6,116	10
Benzene	2,537	1,967	1,813	2,020	29
Toluene	647	497	535	513	30
Xylenes	1,078	913	997	1,052	18
Phthalic anhydride	587	590	539	559	−1
Methanol	1,890	1,771	1,956	2,314	7
Carbon black	750	656	664	642	14

Millions of lb	1979	1978	1977	1976	Change 1978–79
Plastics	15,917	14,835	13,730	14,175	7
Polyethylene	3,500	3,348	3,155	3,234	5
Polyvinyl chloride	2,394	2,213	1,973	2,123	8
Synthetic rubber	977	926	955	834	6
Detergents	3,302	3,051	2,823	2,831	8
Dyes, organic	323	299	297	332	8
Pigments, inorganic	2,323	2,182	2,125	1,989	7
Pesticides	502	497	449	414	1
Nitrogen fertilizers (N)	2,961	2,781	2,867	2,743	7
Phosphate fertilizers (P_2O_5)	1,547	1,553	1,593	1,536	0
FRANCE					
Sulfuric acid	10,798	10,096	9,898	8,710	7%
Hydrochloric acid	1,566	1,509	1,481	1,364	4
Chlorine	2,867	2,779	2,713	2,644	3
Sodium hydroxide	3,142	2,948	2,913	2,742	7
Ammonia	4,730	4,435	4,473	3,918	7
Sodium carbonate	3,430	2,977	2,713	2,644	15
Sodium sulfate	332	275	262	284	21
Sulfur	4,319	4,180	4,204	3,865	3
Ethylene	4,946	4,228	4,107	3,718	17
Phthalic anhydride	194	196	191	185	−1
Methanol	752	763	827	695	−1
Acetone	273	268	271	244	2
Butadiene	660	631	576	504	5
Polyethylene	2,581	2,158	2,097	1,998	20
Polypropylene	440	319	198	165	38
Polystyrene	581	449	513	535	29
Polyvinyl chloride	1,725	1,463	1,419	1,333	18
Synthetic rubber	1,164	1,080	1,054	934	8
Detergents	1,789	1,685	1,663	1,646	6
Dyes, organic	70	62	73	75	13
Phosphate fertilizers (P_2O_5)	2,845	2,660	2,664	2,182	7

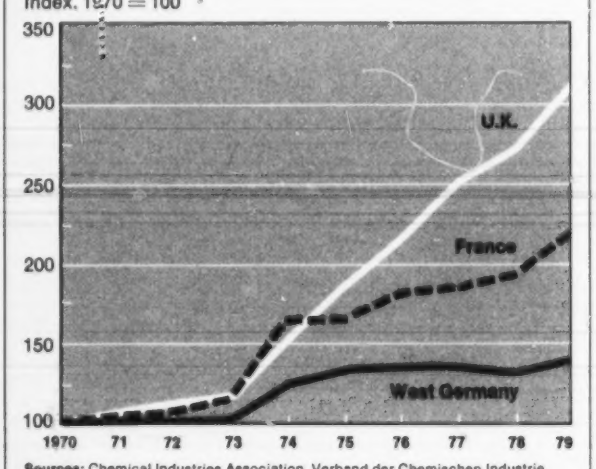
a Estimated. **Sources:** Chemical Industries Association, Verband der Chemischen Industrie, Union des Industries Chimiques

SYNTHETIC FIBERS: Supply/demand pattern is mixed in Western Europe

Millions of lb	1979 Non-cellulosics	1979 Cellulosics	1978 Non-cellulosics	1978 Cellulosics	1977 Non-cellulosics	1977 Cellulosics	1976 Non-cellulosics	1976 Cellulosics	Change, 1978–79 Non-cellulosics	Change, 1978–79 Cellulosics
PRODUCTION										
West Germany	1725	295	1642	293	1568	290	1710	305	5%	1%
Italy	988	156	888	190	830	235	887	234	11	−18
U.K.	838	504	885	478	791	460	911	481	−5	5
France	493	169	542	163	532	179	547	186	−9	4
Spain	466	128	416	133	351	128	327	125	12	−4
Benelux countries	286	165	292	165	295	156	314	151	−2	0
Switzerland	185	7	183	9	171	10	172	10	1	−27
Turkey	na	na	182	10	177	10	98	9	na	na
Ireland	88[a]	—	68	—	35	—	39	—	29	—
Portugal	66[a]	7	62	5	36	6	26	6	7	25
Austria	62	242	67	236	57	226	60	228	−6	3
Greece	na	na	36	16	33	16	29	15	na	na
Finland	—	99	—	96	—	90	—	70	—	3
Sweden	—	73	—	77	—	73	—	67	—	−6
Norway	—	64	—	63	—	54	—	57	—	2
CONSUMPTION										
West Germany	959[a]	337[a]	890	327	872	316	914	346	8	3
Italy	1053[a]	217[a]	880	185	725	211	876	219	20	17
U.K.	1033[a]	326[a]	875	303	799	231	873	316	18	7
France	387[a]	150[a]	549	138	496	136	568	154	−30	8
Spain	493[a]	120[a]	463	141	428	127	480	130	7	−15
Benelux countries	314[a]	123[a]	315	132	326	136	328	151	0	−7
Switzerland	74[a]	24[a]	60	19	60	22	63	22	24	24
Ireland	49[a]	9[a]	49	5	42	6	22	7	−10	67
Portugal	123[a]	32[a]	107	26	95	41	103	38	15	27
Austria	120[a]	68[a]	143	64	128	61	131	65	−16	6
Greece	91[a]	18[a]	80	16	85	22	90	19	13	11
Finland	47[a]	47[a]	37	12	32	12	32	19	27	300
Sweden	38[a]	15[a]	43	12	43	18	54	35	−11	26
Norway	26[a]	25[a]	20	6	21	6	22	18	35	300
Denmark	32[a]	4[a]	35	5	36	5	45	6	−6	−27

a C&EN estimates. **Note:** consumption = production plus imports less exports. **Source:** Comité International de la Rayonne et des Fibres Synthétiques

Prices on chemicals are marked higher



Sources: Chemical Industries Association, Verband der Chemischen Industrie, Union des Industries Chimiques

INDUSTRY TRENDS: Sales up strongly

$ Billions	1979	1978	1977	1976	1975
U.K.					
Sales	$39.7	$29.3	$25.9	$19.2	$17.9
Exports	11.0	8.6	7.3	5.2	4.4
Imports	7.6	5.6	4.5	3.4	2.8
Capital spending	2.4	2.2	1.6	1.2	1.1
Employees (thousands)	438	435	431	425	431
WEST GERMANY					
Sales	$59.2	$48.9	$40.9	$35.7	$30.2
Exports	25.4	20.2	16.8	14.7	11.0
Imports	13.9	10.4	8.7	7.4	5.4
Capital spending	2.6	3.1	2.6	2.4	2.1
Employees (thousands)	548	548	553	556	578
FRANCE					
Sales	$34.9	$27.5	$22.6	$19.3	$18.7
Exports	12.2	8.9	6.9	5.9	5.2
Imports	9.4	7.3	5.7	5.3	4.4
Capital spending	1.3	1.2	1.0	0.9	1.1
Employees (thousands)	301	306	307	307	303

Sources: Chemical Industries Association, Verband der Chemischen Industrie, Union des Industries Chimiques

COMPANY RESULTS: Profitability generally improved

$ Millions	Net sales	Net income	Profit margin	Capital spending	R&D spending	Employees (thousands)
Hoechst (West Germany)						
1979	$15,653.2	$375.7	2.4%	$945.1	$660.1	183
1978	13,365.2	230.4	1.7	807.2	593.4	181
1977	11,041.7	144.2	1.3	707.8	494.8	181
1976	9,951.3	245.8	2.5	711.4	409.3	183
Bayer (West Germany)						
1979	$15,030.1	$251.5	1.7%	$1294.8	$638.2	181
1978	12,616.6	258.0	2.0	954.1	564.1	179
1977	10,138.4	161.1	1.6	895.3	439.3	170
1976	8,847.5	221.6	2.5	700.0	370.8	171
BASF (West Germany)						
1979	$14,968.8	$357.8	2.4%	$1046.8	$515.6	117
1978	11,885.6	232.6	2.0	970.7	458.6	115
1977	10,023.7	183.9	1.8	784.4	370.1	114
1976	8,891.1	257.2	2.9	653.0	289.0	113
Imperial Chemical Industries (U.K.)						
1979	$11,970.6	$961.1	8.0%	$1694.8	$412.6	148
1978	9,247.3	620.2	6.7	1430.0	344.6	151
1977	8,953.0	612.5	6.8	942.7	288.0	154
1976	7,029.5	494.7	7.0	774.6	232.9	192
Montedison (Italy)						
1979	$8,498.8	$ 14.9	0.02%	$470.1	$196.5	115
1978	7,017.0	(326.9)[a]	—	650.1	$166.5	127
1977	6,275.2	(583.7)[a]	—	839.4	149.1	135
1976	5,502.9	(196.6)[a]	—	851.4	130.3	145
Rhône-Poulenc (France)						
1979	$8,403.2	$196.8	2.3%	$547.3	$323.4	102
1978	6,134.5	57.3	0.9	332.8	264.8	107
1977	5,023.6	18.1	0.4	309.8	221.1	111
1976	4,373.4	(73.2)[a]	—	293.6	195.6	113
DSM (Netherlands)						
1979	$6,710.5	$46.8	0.7%	$282.1	$71.1	32
1978	5,130.8	13.3	0.3	514.9	69.2	32
1977	4,445.2	48.2	1.1	618.9	57.0	33
1976	3,782.5	53.7	1.4	519.9	48.0	33
Akzo (Netherlands)						
1979	$6,323.7	$152.1	2.4%	$242.6	$242.1	83
1978	5,469.7	25.1	0.5	222.6	225.6	83
1977	4,575.9	(22.8)[a]	—	179.4	188.6	84
1976	4,369.9	2.4	0.1	167.9	166.7	91
Ciba-Geigy (Switzerland)						
1979	$6,220.8	$205.7	3.3%	$376.1	$518.2	80
1978	5,193.0	209.3	4.0	322.1	443.0	75
1977	4,825.7	203.9	4.2	310.7	368.9	74
1976	3,856.9	130.1	3.4	276.0	295.1	74

$ Millions	Net sales	Net income	Profit margin	Capital spending	R&D spending	Employees (thousands)
Solvay (Belgium)						
1979	$4,319.2	$167.8	3.9%	$302.3	$102.7	460
1978	3,322.5	113.8	3.4	311.3	92.6	45
1977	2,742.1	81.0	3.0	236.8	72.8	45
1976	2,447.0	136.2	5.6	196.8	62.9	44
Hoffmann-La Roche (Switzerland)						
1979	$3,264.7	$137.7	4.2%	$332.1	$406.3	43
1978	2,816.4	116.9	4.2	235.5	370.3	42
1977	2,663.3	163.1	6.1	294.2	na	40
1976	2,079.4	193.1	9.3	226.4	na	38
Sandoz (Switzerland)						
1979	$2,795.0	$108.8	3.9%	$130.2	$242.8	35
1978	2,498.3	90.7	3.6	135.5	219.8	35
1977	2,317.0	103.9	4.5	103.9	196.1	36
1976	1,670.3	58.5	3.5	91.9	148.0	33
BOC International (U.K.)						
1979	$2,740.7	$99.5	3.6%	$294.8	na	49
1978	2,440.0	72.8	3.0	272.3	na	56
1977	1,287.6	90.4	7.0	139.4	na	41
1976	1,032.9	59.7	5.8	79.6	na	41
Fisons (U.K.)						
1979	$965.6	$29.5	3.1%	$39.7	$32.1	13
1978	710.5	38.3	5.4	40.8	26.5	13
1977	563.1	31.4	5.6	34.6	20.5	12
1976	439.1	25.8	5.9	21.6	13.6	11
Albright & Wilson (U.K.)						
1979	$880.6	$37.9	4.3%	$72.7	na	10
1978	697.9	47.1	6.7	88.5	na	10
1977	649.0	54.8	8.4	47.0	na	10
1976	485.0	32.0	6.6	23.6	na	10
UCB (Belgium)						
1979	$728.0	$12.4	1.7%	$22.0	$20.5	8
1978	619.4	3.6	0.6	26.0	20.2	9
1977	519.2	(12.0)[a]	—	24.6	20.2	9
1976	470.6	5.1	1.1	23.0	16.9	10
Laporte Industries (U.K.)						
1979	$423.9	$18.3	4.3%	$35.7	na	5
1978	340.9	10.8	3.2	24.5	na	5
1977	290.9	9.6	3.3	21.1	na	5
1976	223.4	21.1	5.4	11.9	na	5

a Deficit. na = not available.

NOTE ON CURRENCY CONVERSION

For monetary statistics reports in this section, European currencies were converted to U.S. dollars by the following conversion rates:

	$1.00 (U.S.) is equivalent to:						
	U.K.	West Germany	Netherlands	Belgium	France	Italy	Switzerland
1979	0.448 pound	1.73 marks	1.90 guilders	28.01 francs	4.02 francs	604 lire	1.59 francs
1978	0.490 pound	1.81 marks	1.95 guilders	28.63 francs	4.15 francs	623 lire	1.72 francs
1977	0.521 pound	2.11 marks	2.28 guilders	33.03 francs	4.70 francs	872 lire	2.06 francs
1976	0.588 pound	2.36 marks	2.46 guilders	35.96 francs	4.97 francs	875 lire	2.46 francs
1975	0.495 pound	2.62 marks	2.69 guilders	39.58 francs	4.47 francs	684 lire	2.62 francs

Seven years after the first oil crisis, the Japanese petrochemical industry is still feeling its impact.

During the past two years, buoyed by an economic recovery at home, the petrochemical industry has started to show some signs of life. Production, which started to increase in the latter part of 1978, continued to do so in 1979. Ethylene output, for instance, hit a record 4.75 million metric tons.

Actually, the situation isn't all that rosy for Japanese petrochemical producers. Naphtha prices are high and supply is short. Much of last year's surge in shipments was the result of downstream stockpiling brought on by the Iranian crisis.

Price increases gave a boost to profits, but profits still are low by most standards. Prospects for further gains are slim, moreover, because Japanese petrochemical companies are losing their competitive edge, not only in export markets but at home.

WORLD TRADE: Deficit developed in 1979

$ Millions	1979	1978	1977	1976
Total exports	$103,032	$97,543	$80,495	$67,225
Total imports	110,672	79,343	70,809	64,799
Chemical exports	6,100	5,102	4,300	3,747
Chemical imports	5,178	3,763	3,003	2,662

Source: Ministry of International Trade & Industry

INDUSTRY TRENDS: Fibers, fertilizers lag

Index, 1975 = 100	1979	1978	1977	Change 1978–79
All chemicals				
Production	143.7	131.3	117.2	9%
Shipments	143.6	130.0	117.5	10
Inventories	101.1	100.7	101.3	0
Petrochemicals				
Production	147.9	133.4	119.8	10
Shipments	147.1	131.6	117.4	12
Inventories	112.5	109.2	108.7	3
Plastics				
Production	160.4	133.4	114.8	20
Shipments	161.4	132.4	114.7	22
Inventories	99.7	91.6	93.1	9
Synthetic fibers				
Production	129.7	129.6	121.5	0
Shipments	136.2	136.9	123.9	1
Inventories	80.4	95.1	109.2	−15
Synthetic rubber				
Production	140.4	130.4	123.1	8
Shipments	131.0	122.5	116.9	7
Inventories	102.0	102.7	98.5	−1
Fertilizer				
Production	90.2	89.2	85.1	1
Shipments	99.7	96.5	98.9	3
Inventories	72.1	76.3	83.5	−6
All manufacturing				
Production	133.3	123.0	115.7	8
Shipments	130.7	121.4	114.6	8
Inventories	102.6	103.0	104.7	0

Source: Ministry of International Trade & Industry

PRODUCTION: Plastics set growth pace

Thousands of metric tons unless otherwise indicated	1979	1978	1977	1976	Change 1978–79
ORGANIC CHEMICALS					
Acetaldehyde	583	587	624	613	−1%
Acetic acid	502	518	544	550	−3
Acetone	254	261	238	233	−3
Acrylonitrile	579	609	596	633	−5
Benzene	2178	2015	1951	1878	8
Butadiene	658	658	610	601	0
Butyl alcohol	252	222	194	190	14
Caprolactam	437	427	453	473	2
Cyclohexane	509	477	515	531	7
Dioctylphthalate	259	268	236	219	−3
Ethylene	4755	4387	3979	3803	8
Ethylene dichloride	2110	1837	1723	1656	15
Ethylene glycol	572	630	523	550	−9
Ethylene oxide	593	631	538	547	−6
Methanol	940	907	762	951	4
Octyl alcohol, synthetic	264	254	212	200	4
Phenol, synthetic	244	249	221	222	−2
Phthalic anhydride	284	288	260	249	−1
Propylene	3096	2963	2716	2635	5
Propylene glycol	168	163	141	133	3
Styrene	1238	1122	1022	1089	10
Terephthalic acid	613	590	433	282	4
Toluene	925	861	869	858	7
Toluene diisocyanate	66	61	65	64	8
Xylene	1317	1248	1211	1169	6
Urea	2083	2079	1718	1572	0
INORGANIC CHEMICALS					
Ammonium chloride	753	718	709	703	5
Ammonium sulfate	1883	1929	2048	2104	−2
Calcium carbide	570	555	541	552	3
Calcium superphosphate	568	551	607	535	3
Carbon black	538	489	439	409	10
Chlorine, liquid	729	651	689	666	12
Hydrochloric acid	528	540	616	656	−2
Nitrogen, millions of cu m	4150	3717	3941	3525	12
Oxygen, millions of cu m	7070	6329	6773	7981	12
Sodium carbonate	1355	1162	1179	1085	17
Sodium hydroxide	3021	2777	2870	2906	9
Sodium silicate	714	654	632	623	9
Sulfuric acid	6581	6435	6392	6095	2
Titanium dioxide	185	171	150	156	8
PLASTICS					
Phenolic resins	300	268	246	254	12
Polyethylene	2165	1767	1467	1392	23
Polypropylene	1023	745	608	669	37
Polystyrene	1227	1032	900	876	19
Polyvinyl chloride	1583	1204	1030	1044	31
DYES, synthetic	60	54	54	55	11
RUBBER CHEMICALS, organic	45	41	36	33	10
RUBBER, synthetic	1107	1028	971	941	8

Source: Ministry of International Trade & Industry

COMPANY RESULTS: Most profit margins widen in Japan but still remain low

$ Millions	Sales	Net income	Profit margin	Total assets	Employees (thousands)
Mitsubishi Chemical Industries[a]					
1979	$2486.0	$24.1	1.0%	$2996.4	8.2
1978	2457.8	11.0	0.5	3534.6	8.7
1977	2451.2	22.7	0.9	3319.4	9.0
1976	2133.0	18.1	0.9	2689.3	9.5
Sumitomo Chemical[b]					
1979	$2225.3	$28.1	1.3%	$2016.6	9.9
1978	2078.1	18.6	0.9	2532.3	10.8
1977	2006.8	6.0	0.3	2601.2	11.6
1976	1979.1	12.5	0.6	2331.7	15.5
Asahi Chemical Industry					
1979	$2085.0	$44.1	2.1%	$2265.7	13.8
1978	2029.2	33.9	1.6	2475.9	14.3
1977	1979.9	21.9	1.1	2402.0	15.7
1976	1684.8	16.0	1.0	1971.2	17.3
Toray Industries					
1979	$1864.5	$52.1	2.8%	$2010.5	13.9
1978	1929.3	40.3	2.1	2270.9	14.7
1977	1828.1	4.3	0.0	2117.5	16.9
1976	1491.0	14.6	1.0	1731.0	18.4
Teijin					
1979	$1563.8	$28.1	1.8%	$1815.4	7.2
1978	1610.7	10.7	0.7	2016.2	7.7
1977	1552.9	1.8	0.1	1977.1	8.1
1976	1243.9	9.2	0.7	1524.9	11.8
Mitsui Toatsu Chemicals					
1979	$1563.8	$34.1	2.2%	$1613.2	7.8
1978	1455.5	5.4	0.4	1773.5	8.3
1977	1388.1	(19.7)[c]	—	1761.8	8.9
1976	1086.4	(32.5)[c]	—	1427.8	9.5
Showa Denko[b]					
1979	$1463.5	$24.1	1.7%	$1475.1	4.3
1978	1339.3	17.6	1.3	1850.5	5.2
1977	1672.1	(8.6)[c]	—	2192.0	6.3
1976	1348.4	(8.5)[c]	—	1751.3	7.6
Dainippon Ink & Chemicals					
1979	$1283.1	$18.4	1.4%	$1124.1	5.5
1978	1248.2	19.4	1.6	1083.6	5.5
1977	1080.6	16.7	1.6	979.4	5.5
1976	809.6	12.3	1.5	739.2	5.5
Mitsubishi Petrochemical[b]					
1979	$1327.2	$16.0	1.2%	$1384.4	3.9
1978	1213.0	8.8	0.7	1606.8	4.3
1977	1202.7	3.7	0.3	1586.0	4.5
1976	986.8	7.6	0.8	1255.5	4.6
Sekisui Chemical					
1979	$1182.8	$14.0	1.2%	$1106.7	6.0
1978	1127.9	7.4	0.7	1025.3	5.9
1977	955.1	4.7	0.5	854.6	6.2
1976	688.5	3.2	0.5	644.5	6.0
Mitsui Petrochemical Industries					
1979	$1082.6	$20.1	1.9%	$1127.0	4.8
1978	913.8	11.0	1.2	1220.7	4.8
1977	863.9	7.9	0.9	1185.7	4.7
1976	699.5	13.6	1.9	874.0	4.7
Unitika					
1979	$781.9	$10.8	1.4%	$1024.1	6.5
1978	865.3	12.0	1.4	1245.6	6.8
1977	826.8	(39.7)[c]	—	1295.2	8.3
1976	873.3	(36.1)[c]	—	1071.5	12.5
Kuraray					
1979	$741.8	$6.0	0.8%	$824.4	5.2
1978	789.9	1.0	0.1	919.7	5.4
1977	741.0	(14.4)[c]	—	956.0	6.3
1976	623.9	(2.0)[c]	—	794.7	8.7

$ Millions	Sales	Net income	Profit margin	Total assets	Employees (thousands)
Mitsubishi Rayon					
1979	$673.6	$16.0	2.4%	$703.0	3.4
1978	700.7	(5.1)[c]	—	808.4	3.7
1977	799.8	(6.0)[c]	—	918.8	4.8
1976	693.9	16.9	2.4	785.8	5.4
Kyowa Hakko Kogyo[b]					
1979	$701.7	$12.0	1.7%	$584.7	4.8
1978	692.5	13.1	1.9	658.9	4.8
1977	660.8	11.5	1.7	624.1	4.7
1976	495.6	4.9	1.0	483.3	4.7
Denki Kagaku Kogyo					
1979	$733.8	$16.0	2.2%	$881.0	4.0
1978	691.3	9.6	1.4	942.2	4.1
1977	637.1	6.1	1.0	894.6	4.2
1976	497.6	7.5	1.5	643.4	4.3
Toyo Soda Mfg.					
1979	$761.8	$10.0	1.3%	$977.4	4.9
1978	720.5	10.5	1.5	1075.0	5.0
1977	674.3	3.5	0.5	1043.1	5.2
1976	524.9	3.9	0.7	812.5	5.3
Kanegafuchi Chemical Industry					
1979	$641.5	$15.2	2.4%	$466.4	3.0
1978	615.7	7.9	1.3	534.2	3.0
1977	555.5	(2.4)[c]	—	543.7	3.1
1976	438.0	4.3	1.0	459.8	3.2
Mitsubishi Gas Chemical					
1979	$681.6	$13.6	2.0%	$739.8	3.8
1978	604.4	10.9	1.8	823.7	3.8
1977	544.6	8.0	1.5	766.7	3.9
1976	455.5	7.9	1.7	579.7	4.0
Hitachi Chemical					
1979	$581.4	$8.8	1.5%	$335.8	4.1
1978	601.6	6.6	1.1	365.5	4.0
1977	522.5	(2.9)[c]	—	355.8	4.0
1976	407.5	2.9	0.7	276.9	4.1
Tokuyama Soda					
1979	$585.4	$6.0	1.0%	$545.9	2.4
1978	567.8	6.5	1.1	605.8	2.4
1977	523.7	5.3	1.0	592.6	2.4
1976	379.0	2.9	0.8	484.7	2.5
Japan Synthetic Rubber					
1979	$521.3	$9.6	1.8%	$578.7	2.6
1978	514.0	6.6	1.3	594.8	2.7
1977	466.6	4.4	0.9	583.7	2.7
1976	358.0	4.2	1.2	461.9	2.7
Shin-Etsu Chemical[d]					
1979	$481.2	$8.8	1.8%	$418.2	2.2
1978	484.7	7.9	1.6	477.3	2.3
1977	428.9	5.4	1.3	452.7	2.7
1976	343.2	4.7	1.4	346.3	2.8
Nissan Chemical Industry[e]					
1979	$481.2	$3.2	0.7%	$475.8	1.8
1978	483.3	3.1	0.6	553.8	1.8
1977	437.7	1.4	0.3	519.5	2.2
1976	333.3	1.8	0.5	409.6	2.2
Daicel Chemical					
1979	$481.2	$14.8	3.1%	$467.4	3.1
1978	467.0	8.6	1.8	461.5	3.4
1977	453.2	6.5	1.4	425.3	3.4
1976	356.1	5.2	1.5	334.2	3.5
Nippon Zeon					
1979	$433.0	$3.6	0.8%	$477.6	2.8
1978	449.2	3.5	0.8	497.9	2.9
1977	412.1	1.0	0.2	466.1	2.9
1976	318.3	2.1	0.7	377.9	3.0

a Fiscal year starts Jan. 31. b Fiscal year starts Dec. 31. c Deficit. d Fiscal year starts May 31. e Fiscal year starts April 30. **Note:** Fiscal years starting March 31 of each year unless otherwise specified. Fiscal year 1979 are estimates based on results for the first three quarters.

Results were converted from yen on the following basis: fiscal year 1979—$1.00 = 249.4 Y; fiscal year 1978—$1.00 = 209.3 Y; fiscal year 1977—$1.00 = 222.9 Y; fiscal year 1976—$1.00 = 281.0 Y. **Source:** Toyo Keizai Shinposha

Canada's big investment in petrochemicals has started to pay off. Production of such key chemicals as benzene and ethylene, and of major plastics, has more than doubled in the past five years, with gains of 20 to 30% in 1979 alone. But ammonia and urea, after several strong years, showed no growth at all in 1979. Except for phosphoric acid, other high-tonnage items had only modest gains. So despite some glittering exceptions, the overall index of production of chemicals and chemical products increased only slightly in 1979.

Still, most Canadian chemical companies could boast of improved profitability in 1979, thanks to firming prices and booming exports. With big new plants and with relatively low-price feedstocks, Canada's petrochemical producers recently have become a competitive force in world markets. Chemical exports rose 41% from 1978 levels. Chemical imports went up too, but only 23%. Consequently, Canada was, for a change, a net exporter of chemicals in 1979.

TRADE BALANCE: In the black, both overall . . .

$ Millions (Canadian)	1979	1978	1977	1976
Exports[a,b]	$65,327	$52,842	$44,554	$38,475
Imports[c]	62,453	49,938	42,332	37,494
Trade balance	2,874	2,904	2,222	981

. . . and with chemicals, too, for a change

$ Millions (Canadian)	1979	1978	1977	1976
Chemical exports[b,d]	$3,315	$2,357	$1,739	$1,383
Chemical imports[c]	3,213	2,621	1,992	1,682
Chemical trade balance	102	−264	−253	−299

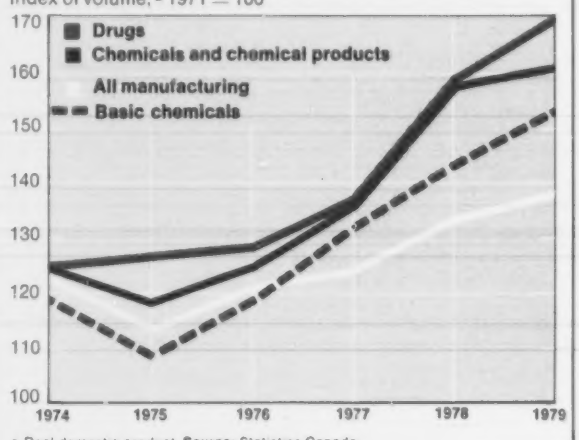
a Includes re-exports. b Values as declared on export documents; may include shipping costs. c Values as established for duty purposes. d Domestic exports only. **Source:** Statistics Canada

COMPANY RESULTS: Profit margins widen

$ Millions (Canadian)[a]	Sales	Net income[b]	Profit margin	Capital expenditures	Employees (thousands)
C-I-L INC.[c]					
1979	$880.0	$36.3	4.1%	$84.4	8.0
1978	746.9	26.4	3.5	97.5	8.0
1977	667.8	24.9	3.7	58.5	8.3
1976	613.9	24.4	4.0	62.1	9.0
CELANESE CANADA					
1979	$353.6	$21.2	6.0%	$24.4	4.4
1978	290.7	7.4	2.4	18.2	4.6
1977	254.7	1.1	0.4	5.7	4.7
1976	216.1	(10.3)[d]	—	20.7	4.7
DOW CHEMICAL CANADA[e]					
1979	$629.7	$50[f]	7.9%[f]	$292	3.8
1978	438.5	27.6[f]	6.3[f]	250.4	3.3
1977	396.4	46.0[f]	11.6[f]	210.3	3.0
1976	369.8	65.9[f]	17.8[f]	87.6	2.8
DU PONT CANADA					
1979	$879.6	$58.9	6.7%	$23.3	5.6
1978	661.9	10.2	1.5	10.7	5.4
1977	537.6	7.6	1.4	16.7	5.5
1976	458.8	(2.1)[d]	—	65.8	5.7
UNION CARBIDE CANADA					
1979	$685.9	$57.8	8.4%	$30.1	4.8
1978	528.2	20.1	3.8	46.3	4.7
1977	406.5	20.5	5.0	82.3	4.7
1976	393.7	29.4	7.5	110.2	4.8

a Unless otherwise indicated. b Excluding extraordinary gains and losses. c Name changed from Canadian Industries Ltd. on Jan. 1, 1980. d Deficit. e Amounts in U.S. dollars. f Profits before taxes.

Drugs, basic chemicals show good growth



a Real domestic product. **Source:** Statistics Canada

PRODUCTION: Ammonia hits a plateau

Thousands of tons unless otherwise noted	1979	1978	1977	1976	Change 1978–79
Ammonia, anhydrous	2657.2	2642.9	2383.0	1530.5	0%
Ammonium nitrate	1002.8	959.9	1019.4	1026.0	4
Ammonium phosphate	1481.6	1299.5	1264.7	1069.4	14
Benzene[a]	4479.4	3491.3	2741.1	2590.9	28
Caustic soda, 100% NaOH	1256.3	1142.2	1117.5	1016.4	10
Chlorine	1140.1	1037.0	979.2	990.2	10
Ethylene	1183.9	910.2	625.3	560.9	30
Hydrochloric acid,	169.9	170.4	150.2	120.7	0
Phosphoric acid, 100% P_2O_5	807.6	610.5	612.5	576.0	32
Polyesters, unsaturated[b]	59.9	44.7	46.1	40.5	34
Polyethylene[b]	1303.0	1052.7	760.7	663.4	24
Polystyrene[b]	263.8	217.7	199.5	167.4	21
Polyvinyl chloride[b]	336.0	275.0	219.8	213.3	22
Sodium chlorate	256.6	219.5	178.1	152.2	17
Sulfuric acid, 100%	4063.0	3594.5	3461.6	3133.2	13
Urea	1335.6	1341.7	887.0	383.0	0

a Thousands of bbl. b Millions of lb. **Source:** Statistics Canada

SHIPMENTS: Chemicals continue to show above-average growth in Canada

$ Millions (Canadian)	Shipments, monthly average									Annual change	
	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1978–79	1969–79
All manufacturing	$12,520.7	$10,743.7	$9070.6	$8190.4	$7371.6	$6871.2	$5563.1	$4687.2	$4189.5	$3865.2	16.5%	12.6%
Chemicals and chemical products	791.9	663.3	535.6	475.3	425.6	383.9	291.9	246.2	231.8	218.3	19.4	13.9
Petroleum and coal products	1,003.0	837.9	711.0	576.8	496.1	432.1	356.1	203.4	176.2	151.6	19.7	21.5
Rubber and plastics products	300.3	250.1	211.0	192.7	162.9	152.8	131.4	109.7	97.0	89.4	20.1	13.0
Paper and allied products	1,032.0	839.5	744.8	685.7	594.2	639.7	439.2	367.8	333.4	327.6	12.7	12.4

Source: Statistics Canada

PRICES: Chemicals up 13.5% with plastics and fertilizers setting the pace

Industry selling price indexes, 1971 = 100	Annual average								Annual change	
	1979	1978	1977	1976	1975	1974	1973	1972	1978–79	1974–79
All manufacturing industries	217.8	190.4	174.3	161.6	153.7	138.1	116.1	104.4	14.4%	9.5%
Chemicals and chemical products	214.8	189.3	175.9	167.2	160.3	137.1	106.5	101.4	13.5	9.4
Industrial chemicals—inorganic	234.1	204.1	188.4	179.7	169.5	133.5	107.7	102.5	14.7	11.9
Acetylene, compressed	213.2	191.2	170.7	163.7	150.6	116.2	102.9	102.0	11.5	12.9
Caustic soda	240.1	221.4	210.7	195.7	169.5	120.2	107.0	103.3	8.4	14.8
Chlorine	207.9	189.2	180.5	163.3	144.4	114.1	104.3	102.2	9.9	12.7
Oxygen, gas and liquid	191.8	174.6	156.8	152.1	136.0	121.2	108.3	102.6	9.9	9.6
Industrial chemicals—organic	289.0	249.8	228.1	214.2	201.2	170.0	107.8	101.6	15.7	11.2
Plastics and synthetic resins	239.7	206.4	193.3	187.4	181.6	156.0	104.2	100.1	16.1	9.0
Alkyd	158.4	137.5	129.4	131.4	135.1	134.8	109.4	101.1	15.2	3.3
Phenol formaldehyde	300.9	233.6	232.1	235.6	240.9	214.1	111.4	98.2	28.8	7.0
Polyethylene	268.9	223.2	220.3	221.6	213.2	166.3	103.2	98.8	20.5	10.1
Fertilizers, mixed	229.1	191.0	180.2	176.9	204.0	167.5	117.2	102.5	19.9	6.5
Drugs	153.1	140.4	131.4	127.0	121.1	109.9	103.5	100.0	9.0	6.9
Paint and varnish	202.3	183.0	172.8	161.9	153.9	131.9	108.2	101.7	10.5	8.9
Pigments and dry colors	219.6	189.7	175.3	164.9	153.4	136.0	103.7	96.6	15.8	10.1
Soaps and cleansing compounds	169.5	151.2	141.1	134.5	132.1	118.0	105.3	101.2	12.1	7.5

Source: Statistics Canada

EMPLOYMENT: Chemical workers' pay rises 10%

	Employment index (1961 = 100)				Average hourly earnings				Annual change	
	1979	1978	1977	1976	1979	1978	1977	1976	1978–79	1976–79
All manufacturing	131.5	127.6	126.3	128.1	$ 7.44	$6.84	$6.38	$5.76	8.8%	8.9%
Chemicals and chemical products	132.4	129.7	128.8	127.0	7.67	6.97	6.51	5.89	10.0	9.2
Petroleum and coal products	133.6	128.9	120.0	114.9	10.04	9.26	8.60	7.63	8.4	9.6
Rubber	130.3	124.1	127.5	125.9	7.38	6.61	6.11	5.64	11.6	9.4
Paper and allied products	130.9	129.5	128.8	128.3	8.93	8.24	7.69	6.89	7.2	9.0

Source: Statistics Canada

CHEMICAL IMPORTS: Organics lead

$ Millions (Canadian)[a]	1979	1978	1977	Change 1978–79
Inorganic chemicals	$351.6	$282.3	$236.0	25%
Organic chemicals	887.5	682.0	493.6	30
Fertilizers and fertilizer materials	136.0	94.6	67.6	44
Synthetic and reclaimed rubbers	118.2	93.9	82.0	26
Plastics materials, not shaped	554.8	483.7	376.0	15
Plastic film and sheet	181.1	152.9	124.8	18
Other plastics basic shapes and forms	134.2	110.9	80.3	21
Dyes, except dyeing intermediates	81.6	76.2	52.3	7
Pigments, lakes, and toners	61.8	49.0	34.2	26
Paints and related products	94.9	82.8	64.3	15
Other chemical products	611.2	512.5	381.2	19
TOTAL	$3212.8	$2620.9	$1992.4	23%

a Values as established for duty purposes. **Source:** Statistics Canada

CHEMICAL EXPORTS: Organics soar

$ Millions (Canadian)[a]	1979	1978	1977	Change 1978–79
Chemical elements	$146.0	$124.8	$110.7	17%
Other inorganic chemicals	839.5	653.6	352.5	28
Organic chemicals	702.5	401.5	301.4	75
Fertilizers and fertilizer materials	983.8	734.9	659.0	34
Synthetic rubber and plastic materials	366.9	261.6	173.1	40
Plastics basic shapes and forms	119.2	84.0	73.2	42
Other chemical products	157.3	96.3	69.0	63
TOTAL	$3315.2	$2356.7	$1738.9	41%

a Domestic exports only. Values as declared on export documents; may include shipping costs. **Source:** Statistics Canada

Economic growth and industrial development in Eastern Europe, including the chemical industry, slowed in 1979 and fell short of planned targets. In the Soviet Union, for example, industrial output rose only 3.4% and chemical and rubber output 3.0%—both the lowest annual increases since World War II.

Production was below or just equal to 1978 levels for those Soviet chemical sectors for which numbers have been released, including plastics and resins, synthetic fibers, pesticides, and fertilizers. Mineral fertilizer production actually dropped (94.5 million metric tons, compared to 98.0 million in 1978 and 96.8 million in 1977).

Growth was much slower, also, in other East European chemical industries, as they grappled with serious problems in energy, fuel, and raw material supplies, productivity, construction, transportation, and labor shortages. Romania's chemical output, for instance, grew only 1%, compared to 10.6% in 1978 and a target of 18.3%.

PRODUCTION: U.S.S.R. largest Eastern European producer by far

Thousands of tons	1979	1978	1977	1976	1975
U.S.S.R.					
Sulfuric acid	na	24,692	23,263	22,063	20,533
Mineral fertilizers[a,b]	na	26,061	25,897	24,901	24,238
Nitrogen[a,b]	na	10,141	10,046	9,490	9,408
Phosphate[a,c]	na	6,708	6,640	6,243	6,075
Potassium[a,b]	na	9,204	9,201	9,160	8,757
Synthetic ammonia[d]	na	12,456	11,843	11,122	10,878
Plastics[e]	3858	3,877	3,648	3,371	3,133
Sodium hydroxide	na	3,047	2,930	2,870	2,640
Synthetic rubber[f]	na	1,979	1,874	1,731	1,598
Pesticides	524	542	537	503	483
EAST GERMANY					
Sulfuric acid	na	1,071	1,022	1,055	1,105
Mineral fertilizers[a]	na	5,075	4,927	4,816	4,393
Nitrogen[a]	na	976	924	855	593
Phosphate[a,c]	na	455	444	466	471
Potassium[a]	na	3,644	3,559	3,484	3,328
Synthetic ammonia[d]	na	1,315	1,246	1,233	1,013
Plastics	na	830	809	748	667
Sodium hydroxide	na	457	466	486	487
Synthetic rubber	na	171	162	160	159
POLAND					
Sulfuric acid	na	3,653	3,602	3,504	3,762
Mineral fertilizers[a]	na	2,889	2,877	2,858	2,845
Nitrogen[a]	na	1,621	1,677	1,706	1,690
Phosphate[a]	na	1,131	1,065	1,023	1,024
Synthetic ammonia[d]	na	1,775	1,835	1,903	1,882
Plastics	na	519	510	492	464
Sodium hydroxide	na	510	485	428	431
Synthetic rubber	na	139	131	129	119
ROMANIA					
Sulfuric acid	na	1,785	1,679	1,714	1,596
Mineral fertilizers[a]	na	2,713	2,184	2,060	1,906
Nitrogen[a]	na	1,890	1,522	1,467	1,424
Phosphate[a]	na	752	604	543	445
Synthetic ammonia[d]	na	2,455	1,976	1,830	1,719
Plastics	na	608	599	513	383
Sodium hydroxide	na	882	810	742	624
Synthetic rubber	na	162	150	105	109

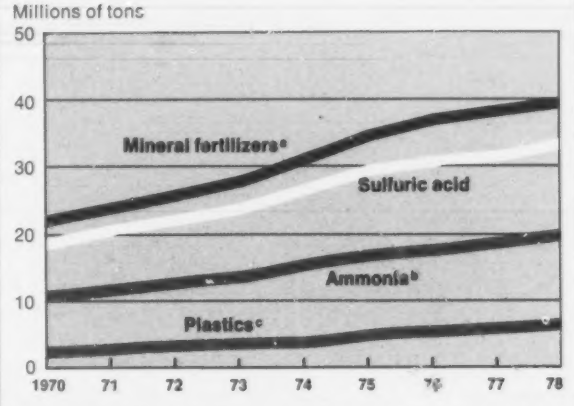
a As N, P_2O_5, or K_2O. b Including some product used for technical purposes. c Including production of ground phosphate rock for direct applications and phosphate animal feeds. d Nitrogen content. e Including resins for man-made fibers. f Estimated. na = not available. **Sources:** Central Intelligence Agency, Department of Commerce

PRODUCTION GROWTH: Slower last year

% annual change in gross output	Plan 1979	1979	1978	1977	1976
Bulgaria					
All industry	7.8%	6.5%	6.9%	6.8%	6.8%
Chemicals and rubber	9.1	8.9	10.0	12.4	4.9
Czechoslovakia					
All industry	4.5	3.7	4.8	5.7	5.5
Chemicals and rubber	na	2.9	5.9	6.7	9.0
East Germany					
All industry[a]	5.5	4.8	5.4	5.4	5.9
Chemicals and rubber[a]	5.8	4.6	9.2	4.4	7.0
Hungary					
All industry	4.0	2.8	4.9	6.6	4.6
Chemicals and rubber	6.4	4.6	10.7	6.9	10.8
Poland					
All industry	4.9	2.8[b]	4.9	6.6	9.3
Chemicals and rubber	7.8	na	3.9	4.4	10.8
Romania					
All industry	11.3	8.0	9.6	12.5	11.4
Chemicals and rubber	18.3	1.0	10.6	13.9	16.1
U.S.S.R.[c]					
All industry	5.7	3.4	4.8	5.7	4.8
Chemicals and rubber	9.0	3.0	6.0	6.5	7.9

a Industrial commodity production. b Sales. c Figures based on Soviet official statistics; Central Intelligence Agency estimates are lower because of postulated upward bias in official figures. na = not available. **Sources:** United Nations Economic Commission for Europe (based on official national statistics), Department of Commerce, Department of State

Output of chemicals in Eastern Europe has doubled since 1970



a As N, P_2O_5, and K_2O. b Nitrogen content. c Including resins for man-made fibers in U.S.S.R. **Note:** Data for U.S.S.R., Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania. **Source:** Central Intelligence Agency

MAN-MADE FIBERS: U.S.S.R. makes more than half of East Europe's total output

Millions of lb	1979	1978	1977	1976	Change 1978–79
NONCELLULOSIC FIBERS					
Bulgaria	na	99	92	92	na
Czechoslovakia	165	163	152	165	1%
East Germany	na	281	273	268	na
Hungary	42	43	37	26	−2
Poland	323	335	323	293	−3
Romania	na	257	251	235	na
U.S.S.R.	na	1045	1003	880	na

Millions of lb	1979	1978	1977	1976	Change 1978–79
CELLULOSIC FIBERS					
Bulgaria	na	73	68	73	na
Czechoslovakia	125	156	160	160	−20
East Germany	na	359	372	374	na
Hungary	20	20	20	20	0
Poland	185	206	211	209	−10
Romania	na	138	132	139	na
U.S.S.R.	na	1397	1364	1346	na
TOTAL	—	4572	4458	4280	—

na = not available. **Source:** Comité International de la Rayonne et des Fibres Synthétiques

SOVIET FOREIGN TRADE: Growing deficit in chemicals

$ Millions	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Exports[a]	64,913	52,432	45,209	37,269	33,401	27,374	21,332	15,409	13,792	12,787
Imports[a]	57,961	50,798	40,914	38,212	37,070	24,861	20,980	16,104	12,467	11,720
Trade balance	6,952	1,634	4,295	−943	−3,669	2,513	352	−695	1,325	1,067
Chemical exports[a]	na	1,284	1,063	939	1,027	887	549	439	396	364
Chemical imports[a]	na	2,188	1,850	1,668	1,747	1,448	954	868	702	618
Chemical trade balance	na	−904	−787	−729	−720	−561	−405	−429	−306	−254

a F.o.b. na = not available. **Source:** Central Intelligence Agency

CHINA SECTION 6

FOREIGN CHEMICAL INDUSTRIES

The People's Republic of China racked up strong increases in chemical production in 1979, led by a 23% rise in production of chemical fertilizer. On a nutrient content basis, 820,000 metric tons of new fertilizer capacity came on stream, as did 83,000 metric tons of synthetic fiber capacity. New capacity for ammonia, fibers, and tires failed to produce enough to meet planned targets, however.

Last year was the first of three in China's economic "readjustment" policy, involving slower and more selective development before the more rapid growth planned under the next five-year plan (1981–85). But capital construction programs remain overextended and further cutbacks are likely.

PRODUCTION: Fertilizers are important

Thousands of metric tons, unless otherwise noted	1979	1978	1977	1976	Change 1978–79
Synthetic ammonia[a]	na	6749	5619	4068	na
Chemical fertilizer[b]	10,654	8693	7238	5240	23%
Nitrogen (N)	8,821	7637	na	na	16
Phosphate (P_2O_5)	1,817	1033	na	na	76
Potassium (K_2O)	16	21	na	na	−24
Sulfuric acid	7,000	6610	5375	na	6
Sodium hydroxide	1,826	1640	1386	na	11
Sodium carbonate	1,486	1329	1077	na	12
Calcium carbide	1,407	1237	na	na	14
Plastics	793	679	524	na	17
Insecticides	537	533	457	na	1
Ethylene	435	380	303	na	14
Synthetic detergents	397	324	257	na	22
Synthetic fibers	326	285	190	na	14
Pharmaceuticals	42	41	35	na	2
Rubber tires (thousands of units)	11,690	9359	na	na	25

a Nitrogen content basis, including only ammonia produced for fertilizer. b Nutrient content basis. na = not available. **Sources:** State Statistical Bureau of the People's Republic of China, Central Intelligence Agency

FOREIGN TRADE: Trade deficit widens. . .

$ Millions[a]	1979[b]	1978	1977	1976
Exports[c]	13,000	9,895	8085	7265
Imports[d]	14,700	10,315[c]	6615[c]	6010
Trade balance	−1,700	−420	1470	1255

. . .with chemicals accounting for bigger share

$ Millions	1979[b]	1978	1977	1976
Chemical exports[c]	na	465	410	330
Medicinal products	na	75	60	40
Essential oils and soap	na	55	60	45
Chemical imports[d]	na	1,125[c]	835[c]	600
Fertilizers[e]	na	410[c]	320[c]	230
Elements and compounds	na	340[c]	270[c]	210
Plastic materials	na	130[c]	90[c]	90
Dyeing materials	na	60[c]	40[c]	20
Chemical trade balance	na	−660	−425	−270

a Numbers rounded to nearest $5 million and are estimates based on data reported by China's trading partners. b Preliminary estimate. c F.o.b. d CIF, unless otherwise noted. e Manufactured, excluding phosphate rock, ammonium chloride, sodium nitrate, and potassium nitrate. na = not available. **Source:** Central Intelligence Agency